

I. K. THERAPY
IN PULMONARY TUBERCULOSIS

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I.K. THERAPY

(IMMUNKÖRPER, IMMUNE SUBSTANCES)

IN PULMONARY TUBERCULOSIS

WITH A SUMMARY OF CASES
AND FORTY-TWO ILLUSTRATIVE CHARTS

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PREFACE.

AMONG the more recent substances used in the treatment of pulmonary tuberculosis which are especially antagonistic to the tubercle bacillus and its products, is Spengler's preparation, Immun-körper, Immune Substances, or shortly I.K.

The literature regarding this product is extremely scanty, and to this dearth seems to be due much of the apathy regarding I.K. shown by medical men who are called on to treat pulmonary tuberculosis. There seems to be a fear of the preparation and a strong unscientific bias against it. All discussion centres round tuberculin, and many are inclined to sneer at I.K. and relegate it to the therapeutic rubbish-heap without trial, fair or unfair. Considering the value of the results this preparation has yielded in my hands, I have made it the purport of this work to set forth whatever benefits have been obtained, and incidentally to show mistakes, in the hope that through error further good may be realized.

It must not be inferred that I place absolute reliance on I.K. In my own work I use tuberculin almost as extensively, and in the treatment of pulmonary tuberculosis I am confident tuberculin will keep its fair share of credit. Tuberculin, however, has its limitations, and as I.K., properly and scientifically used, has achieved results not unworthy of

Preface

note, it merits genuine consideration and just criticism.

It seems fitting here to call attention to two books on I.K. therapy, and to urge the importance of their perusal, in order to comprehend the theoretical and laboratory sides of the subject. These books are *The Treatment of Tuberculosis by Means of Immune Substances (I.K.) Therapy*, by Walter H. Fearis (London, John Murray, 1912), and *I.K. Therapy with Special Reference to Tuberculosis*, by W. E. M. Armstrong, M.A., M.D. (London, H. K. Lewis, 1914.) To these authors I am greatly indebted for many valuable hints, and in my preliminary remarks on the preparation of I.K. and on certain non-clinical points I have drawn extensively from both books, for the reason that the practical consideration of such an aspect of I.K. has been entirely withheld from me.

In this book I have tried to approach the study of I.K. purely on clinical grounds, with a result which I must leave the reader to estimate.

In conclusion, my best thanks are due to Dr. Edward E. Prest, who originally directed me to this particular method of treatment, and under whose supervision my initial attempts at I.K. therapy were made.

W. B.

May, 1916.

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I.K. THERAPY IN PULMONARY TUBERCULOSIS.

WHAT IS I.K.?

IN 1907, Dr. Carl Spengler, of Davos, discovered that tuberculosis immune-substances were manufactured and stored in the erythrocytes, and that relative to the serum they contained as much as 1,000,000 to 1 of these substances. This discovery has been confirmed by Fuchs-Wolfring's investigations on more than 3000 bloods, and similar results have been obtained by Fearis and others. Following on this observation, Spengler injects rabbits intramuscularly with living bacteria, inducing a very high degree of bacteriolytic antitoxic immunity against tubercle bacilli and the bacteria frequently associated with them which are said to be responsible for the condition called secondary infection. The blood of these rabbits is collected aseptically, diluted, acidified with lactic acid, and the bactericidal and antitoxic qualities are adjusted. This product is termed *I.K. Original, Immunkörper, or Immune Substances*.

ITS ACTION.

One c.c. of I.K. Original contains 1,000,000 lytic-antitoxic units, which act in the following manner. The lysins destroy the bacteria causing tuberculosis, and the toxins liberated as a result of this lysis become neutralized by the

antitoxins. In this way a passive immunity is obtained by the introduction of immune substances prepared outside the individual. Resulting from such a passive immunization, the cells of the patient are protected from poisoning by bacterial toxins. Accordingly they are able, in response to auto-inoculation of the neutralized toxins, to generate further immune substances, and thus an active immunity is obtained without any toxic effect. In addition, there is the possibility of a further active immunity being generated by the lysinized bacteria and tubercle bacilli acting as vaccines. It will be observed that I.K. itself contains no active immunizing agents, but that such agents are formed autogenously. The primary action of I.K. is therefore to produce *passive* immunity, whilst its secondary action is the production of *active* immunity.

METHOD OF DILUTION.

In order to use I.K. in the treatment of pulmonary tuberculosis, it is essential to dilute the original preparation to proper standards of strength. The diluting fluid may be a solution of either sodium chloride or carbolic sodium chloride, as follows :—

R	Sod. chlorid. pur.	0·5	|	Aq. dest.	ad 100·0
R	Sod. chlorid. pur.	0·5	|	Aq. dest.	ad 100·0
	Acid. carbol. pur.	0·5			

In both instances the resulting fluid must be filtered and sterilized. The latter preparation is by far the more satisfactory. Spengler urges the following precaution. The solution must not be alkalized, for the I.K., being a preparation from the slightly acid blood of immune animals,

might, if alkalinized, have too strong a lytic effect, and decompose if kept in stock. To make the dilutions in small quantities, a 1 c.c. 'record' syringe graduated in tenths may be used, or when larger quantities are required, a 5 c.c. or 10 c.c. syringe. The procedure is the same as in making tuberculin dilutions. To begin with, 0.1 c.c. of *I.K. Original* is mixed with 0.9 c.c. of the diluting fluid. This makes a solution of strength 1-10. Of this solution 0.1 c.c. is added to 0.9 c.c. of the diluting fluid, resulting in a solution of 1-100. And so on with the other strengths. In this manner a series of dilutions results as follows :—

Dilution	I.—1-10.
„	II.—1-100.
„	III.—1-1000.
„	IV.—1-10,000.
„	V.—1-100,000.
„	VI.—1-1,000,000.
„	VII.—1-10,000,000.

The solutions should be kept in sterile glass-stoppered bottles with fairly wide mouths—each bottle being labelled with the strength of solution it contains. It is wise to date each preparation, so that no error need arise through the use of an antiquated solution. Dilutions made up with all care, and kept properly in a dark place when not in service, should last for from fourteen days to a month. It is with regard to the question of keeping the dilutions that the employment of the second-mentioned diluting fluid is recommended ; there is no doubt that the carbolic acid prevents the appearance of a whitish flocculent fungus which is apt to grow when only saline solution is used, and which must find its entrance while a dose is being extracted from the bottle.

METHODS OF ADMINISTRATION.

There are two serviceable methods which cover all cases—by subcutaneous injection and per os. Another method, that of inunction, is redundant and never need be used ; it is mentioned here only because of its possibility.

There is no necessity to describe in detail the technique of giving a hypodermic injection. The most convenient syringe is the 1 c.c. 'record' divided into tenths and twentieths; and as I.K. is acid in reaction, it is necessary to use platinum-iridium needles and not steel ones. These needles do not spoil by boiling, and it is possible to get them of such fineness that the process of giving an injection will occasion the patient no pain whatever. Furthermore, by using fine needles the dirty necessity of covering the puncture is obviated—a practice not uncommon among those who use large needles for handiness. The most convenient site for injection is the extensor surface of the upper arm. The usual precautions as to sterilizing the skin must be taken, by using spirit soap followed by methylated spirit, or, where the arms are clean, spirit alone. The injection must be made subcutaneously—a fold of skin being raised up and the needle inserted in an oblique direction.

In giving I.K. per os, a larger needle through which to suck up the required amount into the syringe is used, as the wider the bore of the needle, the less time is spent in the process. Once the desired quantity has been obtained and freed from air-bubbles, a further amount of diluting fluid is added sufficient to fill the syringe, and the total contents are expelled into an ordinary teaspoon. The dose is then conveniently given to the patient, and nothing is lost, as must happen if given from a glass vessel by drinking.

MODE OF ABSORPTION.

The rapidity with which I.K. is absorbed may be measured clinically by studying the time it takes to manifest its action for good or ill subjectively or objectively. Whilst it is not possible to record subjective evidence graphically, the same cannot be said regarding temperature data when a reaction takes place with untoward feelings as subjective evidence, or where there is a fall in a febrile temperature following an administration. Generally speaking, the absorption of I.K. is extremely rapid—its effect being noticeable in about an hour. Variations in the rapidity of absorption are, however, met with in both the subcutaneous and oral methods of administration.

In the case of subcutaneous medication the time taken depends on the vascularity of the tissue into which the injection enters, while when given orally, factors depending on the stomach and its contents come into play. In the majority of cases, however, there is no clinical distinction to be found as regards rate of absorption between the two routes of administration.

Judging from this, and also from its efficacy administered in either way, it must be taken that I.K. is not dissociated in the stomach. Furthermore, no irregular absorption of I.K. can be noted when given by the oral route.

GENERAL PRINCIPLES OF DOSAGE.

There are two methods of treatment by Spengler's I.K., the gradual and the rapid, each of which will require a separate description as to the principles concerned. The same principles of dosage apply to both the subcutaneous and oral routes of administration.

I. The Gradual Method.

This method of treatment aims at the somewhat gradual destruction of the bacteria, and at the gradual attainment of an increasingly high degree of immunity. It consists in beginning with minimum doses in extreme dilution, and slowly passing on to the higher concentrations. Treatment can be commenced in practically all cases with a dose of 0.15 c.c. or 0.3 c.c. of Dilution VI. In passing from one dose to a subsequent one, the method of doubling will be found the least troublesome and at the same time to be the optimum method as far as results go, pre-supposing a suitable straight-going case. Starting with 0.15 c.c., the dosage would thus run as follows : 0.15, 0.3, 0.6 of Dilution VI, and continuing 0.12, 0.24, and so on of Dilution V.

In practice, however, in order to preserve a uniform scale, and as in no way does it mitigate treatment, one should proceed with 0.15 c.c. instead of 0.12 c.c. of Dilution V. By so doing the scale assumes a uniform character of 0.15, 0.3, 0.6, 0.15, 0.3, 0.6. Following such a scale, treatment may be continued until 0.6 c.c. of I.K. Original is reached, although in many cases it is not necessary to go so far.

As regards the interval between the consecutive doses, one week will be found the most satisfactory in the majority of instances. In some cases, however, doses may be given twice weekly with advantage, but the circumstances calling for such a departure will be considered elsewhere. The final dose (0.3 c.c. or 0.6 c.c. of I.K. Original) in the scale advised above should be repeated at ever increasing intervals if thoroughly tolerated, until the condition of the patient warrants one in believing that recovery has taken place ; or if such a result has been obtained at the end of the scale, it may not be necessary to so repeat the dose.

The patient can then be left alone for a month's trial, or treatment may be broken off by giving a dose of a weak dilution, such as 1-1000, and then stopping. The latter method of suddenly breaking the scale will be found very effective. In some cases where it is considered unwise to cease treatment suddenly, the dosage may be tapered off by a descending series. Suppose 0·6 c.c. of I.K. Original has been given, the subsequent dose of 0·6 c.c. of Dilution I can be administered, followed by 0·6 c.c. of Dilution II, and so on at weekly or twice-weekly intervals until Dilution VI or Dilution VII is reached, when treatment can be stopped, or if necessary an ascending series commenced again. Such a procedure, however, is rarely required.

Treatment must be continued as long as there is necessity, but generally in a case that has responded satisfactorily to weekly administrations of I.K., it lasts under six months. Mention has been made that at the end of the scale of dosage the patient may be given a month's trial without any treatment whatever. At the completion of that time the condition of the patient should be noted; if satisfactory, the probationary period can be further extended to two months; and so on. In the event of any untoward symptoms reasserting themselves, treatment should be again undertaken by the same method, or by the rapid method about to be described.

2 The Rapid Method.

This method aims at a more rapid attainment of immunization, and is carried out in the following way: Starting with a dose of Dilution VI, and allowing an interval of a week to elapse, a similar dose of Dilution V is given. Thereafter follow doses at weekly intervals, each of which is ten times stronger than the one preceding.

Treatment by this method may be continued until I.K. Original is reached. Generally, however, it is better, when one has reached the stronger dilutions such as III or II, to adopt the gradual method, owing to the tendency in most cases for lytic reactions to occur. The significance of these reactions will be discussed later. It is sufficient at present to indicate the scales of dosage to be pursued in suitable cases and under the best of circumstances. The same methods for concluding treatment apply here as in the gradual method.

LYTIC REACTIONS.

The lytic reaction is characterized by an increase in the temperature, pulse, sputum, and cough, and is accompanied subjectively by symptoms of malaise, lassitude, sleeplessness, pain in the chest, etc., and objectively by a loss in weight. It is due to the too great destruction of bacteria by the bacteriolytic component of the I.K. used, giving rise to toxins far in excess of the antitoxins available in a given dose. The reaction comes on early, and is usually felt by the patient within twelve hours. Just as with the tuberculin reaction, it will be best described by considering it as a triple entity and paying attention to its manifestations: (1) *General*; (2) *Focal*; (3) *Local*.

I. The General Reaction.

The most characteristic element is the rise of temperature. Just as in the tuberculin reaction, there are several varieties of the lytic reaction. In *Charts I* and *II* are shown prolonged reactions of a severe type, characterized, in addition to the rise in temperature, by an increase in sputum and pulse, and a considerable loss in weight. *Chart III* shows a sudden sharp reaction taking place rapidly, reach-

ing its maximum, and quickly passing off. In *Chart IV* is an example of a very severe continuous lytic reaction; such reactions tend to be exceedingly prolonged, and if left untreated may extend over several weeks. Corresponding to these severer forms are similar reactions of a milder nature which follow the same type of curve; and, combining the qualities of the short and the prolonged reactions, are all kinds of intermediate varieties.

Occasionally the lytic effect does not take place until the third or fourth day after the administration of the I.K. This is the delayed lytic reaction (*Charts V* and *VI*), and when of a mild nature it closely resembles a recrudescence of the disease (*Chart XX*), due to the effect of the dose having worked off. The differential diagnosis between such a delayed reaction and recrudescence will be considered in detail later, as it is of great importance in treatment.

In very rare instances the lytic effect is characterized by one or two secondary oscillations, due in all likelihood to slight focal reactions echoing the primary reaction. *Chart VII* shows such a condition.

Another lytic reaction demanding close attention, owing to its particularly intractable nature, is the cumulative lytic reaction. This arises from giving the patient the same or about the same dose as one already given within a week or thereabouts. *Chart VIII* shows a typical cumulative lysis of a very severe nature. It is an interesting point that cumulative lytic effects are mostly associated with doses of the weaker dilutions such as 1-1,000,000 or 1-100,000. As treatment progresses, and stronger dilutions are reached, it is found that where ordinary precautions are observed cumulative lysis does not take place so readily (*Chart XII*), although its occurrence has been noted (*Chart XIII*).

2. The Focal Reaction.

This takes place in the seat of, or near, the tuberculous lesion, and is manifested both subjectively and objectively. The subjective signs have already been enumerated, malaise, pains in the chest, etc. Objectively, the important manifestation is increase in sputum, with, it may be, the occurrence of blood in it. On examination of the chest, an increase in physical signs is evident, just as in a tuberculin focal reaction:

Owing to the fact that I.K. is able to cause a focal reaction, it might be found of use in the diagnosis of latent tuberculous lesions, although it does not appear wise to stir up activity intentionally by such a method.

3. The Local Reaction.

This reaction or swelling of the arm at the site of, or surrounding, the point of injection, is not very common with I.K., and when it does take place it is often associated with other lytic phenomena.

SIGNIFICANCE OF LYtic REACTIONS IN TREATMENT.

The occurrence of the severe forms of lytic reactions must be viewed with alarm. If the symptoms do not pass off within three or four days, a 'relieving dose' should be given, that is, a dose of a much weaker dilution than that which called forth the reaction. For example, when a lytic reaction follows an administration of original I.K., or of a strong dilution such as 1-10, the relieving dose should be given from medium dilutions such as III or IV, and from extreme dilutions such as VI or VII when the reaction is due to a dose of a medium dilution. Following the relieving dose, the temperature usually falls, with noticeable

improvement in the general condition. This is shown in *Charts IV and VI.*

It is interesting to note here that it has been shown that weak dilutions are relatively more potent than the strong in antitoxic qualities, so accounting for the antitoxic value of the relieving dose.

Following on the disappearance of all lytic symptoms, treatment should be again resumed on the gradually increasing system, commencing from the relieving dose as the initial one in the series. It is unwise to proceed by the rapid method after a lytic reaction of a severe nature, as by this system of dosage there is a great chance of having further reactions.

While no difficulty as to what to do presents itself with the severe lytic reactions, there is always consideration required when a mild lysis occurs. Where a mild lytic reaction has had for result an increase in weight, improved appetite, and an amelioration of other symptoms, it is wise to go on by doubling the dose, careful regard being paid to the temperature, so that the following dose be given when the lytic effect has fully passed off. In this way no lysis in the cumulative sense can occur. *Charts IX and X* are illustrative of the beneficial effects following a slight lytic reaction. Where, on the other hand, a slight lysis has occurred with no material benefit to the patient, it is better not to proceed in the usual manner by doubling the dose, as by this procedure a more severe lysis may take place. This error in treatment is shown in *Chart XI.*

However satisfactory the results of a dose have been, it is unwise to give exactly the same dose at the usual interval in the expectation of similar results. This holds particularly with regard to the weaker dilutions, inasmuch as cumulative lytic reactions of a very pronounced intractable type are

apt to occur. When the stronger dilutions, such as 1-100, 1-10, or I.K. Original have been reached, it may be beneficial to repeat the dose where a slight lytic effect has been produced; but this course should never be adopted where good results have been obtained without lysis (*Chart XII*). Even where a slight lytic reaction has taken place with the stronger dilutions, there is always some risk of a cumulative lysis setting in on repeating the same dose (*Chart XIII*). In cases where treatment has been interrupted for a period of two or three weeks, there is no danger in giving the same dose as that last given.

In the foregoing, attention has been devoted entirely to the significance of the general and focal reactions in treatment, to the exclusion of the local reaction. The latter, however, although not so important, has a value of its own. This reaction is usually accompanied by other lytic phenomena, under which circumstances it loses its individual significance. It sometimes happens, however, that the local reaction is the only sign of a lysis having taken place—and when this is so, the presence or absence of the reaction becomes of moment. Its extent must be judged as in the general reaction, and treatment pursued accordingly. If the reaction is slight and of *value*, like the mild lysis already described, it is best to go on increasing the dose in the usual way. If, on the other hand, the local reaction is severe, even though—as may happen—unaccompanied by general lytic phenomena, it is better to give a diminished dose or a relieving administration, or if considered safe, the same dose that called forth the reaction. One of these measures should be adopted, except in well-known cases which have a tendency to react locally, as the occurrence of a local reaction in one not subject to such, very often heralds the approach of a general lysis (*Chart XIV*).

PSEUDO-LYTIC REACTIONS.**GENERAL AND FOCAL REACTIONS.**

In addition to the pure lytic reactions described above, there are certain other general and focal reactions which, although not due to I.K. administration, are apt to be mistaken for it. Such pseudo-lytic reactions are divisible into two kinds: (1) *Those due to physiological causes*; (2) *Those due to pathological causes*.

1. Those due to Physiological Causes.

It is very often observed that the premenstrual rise in temperature coincides with a dose of I.K. having been given. This is shown clearly in *Charts XV* and *XVI*. Unless such a condition of matters is looked for, it may be supposed when next the patient comes for treatment, that a slight lytic reaction has taken place. Of much less frequency are two other menstrual temperature elevations, the one occurring during the menstrual period, and the other immediately following. As these menstrual disturbances of temperature are often accompanied by tiredness and a slight loss in weight, it is very important, where one is dealing with female patients, to be thoroughly conversant with the menstrual history of each, in order to avoid error.

2. Those due to Pathological Causes.

Of pathological causes, it is necessary to distinguish two kinds: (a) Those associated with the tuberculous condition; (b) Those associated with other conditions.

a. Those Associated with the Tuberculous Condition.—The occurrence of autotoxic symptoms during I.K. administration must be carefully watched for, in order that one may not be led into the error of regarding the temperature elevation as due to lysis. Such autotoxic conditions arise

where the patient has indulged in too violent exercise, and in many cases even from such slight causes as having had a bath, or a restless night. In dispensary practice, where the patient may have some distance to travel in order to procure treatment, an autotoxic rise of temperature on the day following his visit may be very misleading, and it becomes necessary in some cases to differentiate between rest and exercise pulse-temperature data in order to fully eliminate the possibility of a slight lysis. *Charts XVII* and *XVIII* show autotoxic rises of temperature taking place during the currency of I.K. treatment.

Another pseudo-lytic elevation of temperature associated with the tuberculous condition is that due to recrudescence of the disease. When the temperature rises towards the third or fourth day after an administration of I.K., and is accompanied by a feeling of malaise, etc., the point arises as to whether this is a delayed lytic reaction (*Chart VI*), or is due to toxic symptoms of the disease reasserting themselves owing to the effects of the dose having worked off. Clinical considerations alone are usually sufficient to establish an opinion one way or the other. The weight of the patient, pulse-rate, history of the onset of subjective symptoms with reference to feelings of well-being, appetite, etc., give one a fairly good idea of the cause; and moreover, if these attacks are of common occurrence, taking place regularly after each injection or oral administration, it is conclusive evidence that a further dose of I.K. is necessary, and that the untoward condition is due to recrudescence of the disease. *Chart XIX* shows such a recrudescent temperature. The same condition is shown in *Chart XX*. In this instance, after the tendency to recrudescence had been noted, doses were given twice weekly, with the result that the temperature steadied.

For purposes of treatment, the differential diagnosis between the two conditions of delayed lysis and recrudescence is all important. In the case of delayed lysis a relieving dose is required, whereas in the event of recrudescence an increased dose is indicated.

Dr. W. E. M. Armstrong points out that where tubercle bacilli are present in the sputum, a bacterioscopic test may be applied to differentiate between the two conditions. Stained by the 'structural method' described in his book (*I.K. Therapy with Special Reference to Tuberculosis*), degenerated and mutilated bacilli will be found in the sputum if the rise of temperature, etc., is due to lysis, whereas if it is due to recrudescence, clearly stained and healthy young bacilli will be found.

(b) *Those Associated with other Conditions.*—Pseudo-lytic reactions due to other pathological conditions take place; but apart from being liable to convey a wrong idea of the tuberculous disease and its treatment, they are of little importance. *Chart XXI* shows a rise of temperature following a dose of I.K. but which was due to an alveolar abscess. Similar rises are met with in association with sore throat, neuralgia, common colds, etc. (*Chart XXII*). In order to differentiate these temperature rises from lytic reactions, it is only necessary to interrogate the patient, when the condition will be recognized.

LOCAL REACTIONS.

The following causes—which are all due to faulty methods, and need not occur—may produce a swelling of the arm at the site of the injection:—

1. The needle is blunt or too large.
2. The dose is too bulky.
3. The injection is made into the skin.
4. Sepsis occurs.

HYPERSENSITIVENESS.

This is a rare condition, occurring most commonly in early female cases. The condition manifests itself following the first administration, usually subcutaneous, of a dose of an extreme dilution. The patient feels ill, the temperature rising very rapidly just as in the short severe lytic reaction, which it resembles in every way (*Chart XXIII*). No treatment apart from rest is required. In cases showing hypersensitiveness, it is unwise to continue on the same lines that called forth the reaction. For example, if the reaction follows an injection, the exhibition of I.K. should be stopped for about fourteen days, when treatment may be resumed by the oral route. This procedure overcomes all hypersensitiveness; and should the condition of the patient demand it later, treatment can be continued subcutaneously. To neglect a hypersensitive temperature elevation, and go on treating by gradually increasing the dosage, is disastrous. Typical lytic reactions follow, manifested locally by swelling of the arm, generally by malaise and increased temperature, and often focally by haemoptysis, etc. (*Chart XXIV*). It would thus appear that the hypersensitive reaction is essentially a lytic reaction taking place at the very inception of treatment.

EXAMINATION OF CASES BEFORE TREATMENT.

Prior to undertaking treatment of any kind, it is essential to have a complete mental view of the condition of the patient, and for this reason it becomes necessary to make a thorough *routine examination*.

Especially in dealing with a disease like pulmonary tuberculosis, where significant factors may be found scattered

through a series of preceding years, the examination must not only refer to the present illness, but should embrace data regarding previous health, family history, and all that comes under the heading of environment. Little need be said concerning this aspect of the examination, as in no wise does it particularly affect treatment by means of I.K. as apart from any other method. The importance, however, of an exhaustive study of the previous health should always be borne in mind.

Attention to such an aspect of the examination will be well repaid by the knowledge derived concerning the duration of the tuberculous process, judged from the history of significant illnesses such as pleurisy or influenza—the latter often being, if recurrent, a tuberculous auto-inoculation. Of more immediate importance, however, are the symptoms of the present illness.

This aspect of the routine examination is belittled too much, considering the amount of valuable information it yields as to the activity of the disease. After all, it is the presence of symptoms that makes the patient seek advice ; it is not simply because he has or has not some particular kind of pathological condition in his chest. The following symptoms are those to which attention must be given : Cough ; sputum ; haemoptysis ; night sweats ; pain in the chest ; shortness of breath ; alteration in weight ; loss of appetite ; indigestion and debility. In order to fully appreciate the meaning of these symptoms, it is essential to know the date of the onset of each. These symptoms, or a combination of a number of them, form the actual disease from the standpoint of the patient ; and as the first signs of success in I.K. therapy are subjective, it is wise for the physician to take particular note of them.

The next part of the routine examination is objective,

and comprises the recording of any important data connected with the various systems of the body—respiratory, alimentary, circulatory, genito-urinary, etc. The data of greatest importance for treatment purposes under this section of the examination are the temperature (rectal); pulse-rate; body weight; amount of sputum; and, of course, the facts elicited by a thorough and exhaustive examination of the chest. More need not be said as to these data, as they are of importance in all forms of well-regulated specific treatment, and anything of particular interest connected with treatment by I.K. will be mentioned under a more appropriate heading.

SUITABILITY OR UNSUITABILITY OF CASES FOR TREATMENT.

Judging by physical signs, symptoms, and all the other data one employs for the summing up of any particular case, it is impossible to say definitely regarding that patient whether or no the treatment will prove of benefit. This may be said also regarding tuberculin, although with both tuberculin and I.K. there is in the mind of the experienced worker some instinct that leads him to the selection of a particular method of treatment. It is not instinct in the ordinary acceptance of the word. It is primarily the outcome of an indefinite observation of events in the past—a subconscious observation—which leads ultimately to observation of a definitely conscious nature.

Putting aside this means, which can only be obtained by a sincerity in work occupying some time, there is a method which is scientifically accurate and which gives one a definite knowledge as to the suitability or unsuitability of the particular patient for I.K. treatment. This is the method of experiment. A dose can be given to the patient, not

as a 'test' in the diagnostic sense in which tuberculin is used, but as a preliminary trial or test in the therapeutic aspect.

Such a test may reveal several things. It may show that the patient is eminently unsuited for treatment owing to the condition of hypersensitiveness to I.K. For it is a reasonable attitude to take up, that if the temperature rises to a febrile point and continues high for several days, during which the patient is definitely ill, then the treatment should not be continued. (See HYPERSENSITIVENESS.)

The initial trial dose, on the other hand, may show that the patient is eminently suited for this treatment. Such suitability would be shown, for instance, by a fall or a steadyng in temperature, accompanied by an amelioration in the subjective condition of the patient.

In other cases, as far as physician or patient can judge, the trial dose may have had no effect whatever. In such cases it is well to continue the treatment until I.K. is found under the usual conditions of administration to be either beneficial, harmful, or inert. Before deciding that I.K. is inert, Fearis, in *The Treatment of Tuberculosis by means of Immune Substances (I.K. Therapy)*, urges that the following methods of increasing the lytic effect should be tried :—

1. Diminution of the acidity of I.K.
2. Repetition of doses of the same strength, especially very weak doses.
3. The method mentioned by Benöhr and Hoffman, in which, after raising the dose by tenfold increases until the original is arrived at, one returns back in one step to the same strength as that with which the treatment was commenced, after which the dose is increased a hundred to a thousandfold (*Chart XXX*).

Fortunately the cases requiring such measures are extremely rare. In the great majority of instances in which I.K. appears at first to be inert, it will be found that if administered on the rapid method, by increasing doses tenfold each time, some result will be obtained. Should it be found essential, however, to try any of the methods given of increasing the lytic effect, these should be (2) or (3) above. To decrease the acidity of I.K. involves one in difficulties with succeeding doses, and therefore (1) should be discarded. Repetition of doses (2) has already been mentioned, when dealing with the lytic reaction, as being dangerous, especially where small doses are concerned, in that such a procedure is apt to provoke a cumulative lysis. For this reason the method of repeating doses of the same strength should be used as seldom as possible. Method (3) is by far the best. Moreover, the ease with which it is applicable to the rapid method of dosage advised enhances its value. Having increased the doses rapidly to I.K. Original, the administration of a small dose of Dilution VI, after the manner of a relieving dose, will be found of the greatest value, especially subjectively (*Chart XXX*). This action is also very marked where a good result has been obtained all along the ascending series, as has already been observed under general principles of dosage.

I.K., however, is not an absolute specific. It fails, as all measures must do, through faulty administration; and in our present state of knowledge there is much still unknown regarding it in both its theoretical and practical aspects. Putting aside such reasons for failure, there still remain many others—reasons to be found in the peculiarities of the patient's general condition. Patients with severe complicating illnesses such as extreme anaemia, with

profound debility, or who are suffering from bad cardiac disease, are better left untreated. Cases which, on anatomical grounds, are hopeless, must be judged individually, owing to the fact that in many of them subjective amelioration may be obtained through skilful administration of I.K. The same individual standards must also be employed when dealing with secondarily infected cases. Many hitherto regarded as beyond any help will be found to derive the greatest benefit. Indeed, it is in this class of case that a physician of experience in I.K. therapy often looks for his most wonderful results.

CONTRA-INDICATIONS TO TREATMENT.

Theoretically, the use of I.K. is not contra-indicated in any case. In practice, however, patients are found in whom, as far as can be judged, it produces no benefit, and even in some cases harm. In discussing the question of the suitability of cases for this treatment, it was explained how selection could be made by experiment. In some cases, however, such a procedure seems scarcely warrantable, owing to the hopelessness of any chance of improvement. Such cases are those manifesting cachexia of a marked nature, accompanied by great rapidity of the pulse, and fever. Cases with accidental concomitants such as diabetes, cardiac disease, nervous disease, etc., must be judged individually, although the treatment of them is usually disappointing. Owing to the enormous importance of the erythrocyte system of the patient, cases showing profound disease of this system, such as leukæmia or pernicious anaemia, should be left alone. In the less severe anaemias, additional treatment directed to the blood condition should always be adopted. The incidence of

pregnancy is not a contra-indication, and treatment under such circumstances will be discussed later.

In addition to the contra-indications mentioned, there are other circumstances of an external nature which justify the withholding or the cessation of treatment. Such circumstances arise when the patient wilfully interferes with the recording of his temperature, a crime against himself which is often committed when the physician is a keen advocate of rest in bed.

CLASSIFICATION OF CASES.

For the purpose of I.K. therapy, the arbitrary division of pulmonary tuberculosis cases into stages is of little value. This can be said especially of division on anatomical principles, although such a division has a meaning in conveying a mental impression of the type of the case. The same applies also to methods of division according to the evening temperature. When these two methods, however, are joined, and made even more widely embracing by taking cognisance of pulse data, one arrives at a method of division which, while still defective, as all arbitrary methods are, reaches as near as possible to the ideal.

There are several methods of division on anatomical lines, which, despite slight variations in their stage definitions, result in the ultimate classification of cases into Stages I, II, and III. It is presumable that, taken on the whole, such classification approximates to uniformity, for so much in physical diagnosis depends on the observer and his scheme of interpretation. Again, arbitrary divisions according to temperature are inaccurate, but when classified by this means, some idea of the toxic process and of the severity of the disease is obtained. Even so discrepancies arise, as for instance when an advanced dying case has no tempera-

ture elevation, or where an acute early case has. The following scheme adopted by Spengler is, however, a working one :—

Afebrile temperatures: not exceeding 37° C. (98·6° F.).

Subfebrile temperatures: over 37° C. (98·6° F.) and not above 38° C. (100·4° F.).

Febrile temperatures: over 38° C. (100·4° F.).

While such methods of classification, or similar methods, should always be employed for statistical reasons, it must be borne in mind that for treatment by I.K., the question in no way depends on the amount of pathological change present, or on the severity of the disease, but on the suitability of the patient for the treatment. This has already been indicated, and the method for determining such suitability or unsuitability given.

ADMINISTRATION IN SPECIAL CASES.

Under GENERAL PRINCIPLES OF DOSAGE, methods of administration of I.K. have been given suitable for the great majority of cases of pulmonary tuberculosis. Generally speaking, such cases are those with afebrile and subfebrile temperatures.

The safer method to pursue is the gradual method of treatment. It is applicable to all manner of cases, and at any rate until sufficient experience in I.K. therapy is gained, should be the only method used. The interval between doses, and the slower or more rapid passing on to stronger concentrations, are points which depend on how the patient responds to the treatment, and they have already been described in detail (*Charts XXV and XXVI*).

The rapid immunization method, being more dangerous on account of the tendency to provoke lytic reactions,

should only be used in the afebrile and subfebrile types manifesting no severe clinical symptoms (*Chart XXVII*). In instances where any doubt is entertained as to a lytic reaction setting in, the case should be transferred to the gradual method.

Under the same heading (GENERAL PRINCIPLES OF DOSAGE), different methods of giving the final doses have been dealt with. As examples of these methods, *Charts XXVIII, XXIX, XXX, XXXI*, are added. *Chart XXVIII* shows the cessation of treatment on arriving at I.K. Original. *Charts XXIX* and *XXX* indicate the sudden breaking of the ascending series by the administration of a dose of a weak dilution. *Chart XXXI* is an instance of tapering off treatment by giving a descending series.

The lytic effect which is very often beneficial, and to which attention was drawn by Benöhr and Hoffman, is shown in *Chart XXX*.

While the two foregoing methods cover the greater number of cases one meets with, exceptional cases arise which demand further study. Such are the following : (1) *Early febrile cases*; (2) *More advanced febrile cases*; (3) *Cases with hectic fever*; (4) *Bronchitic cases*; (5) *Cases with inverted temperature*.

It is in such cases that the administration must be tempered in a special sense to the requirements of the individual. This regulated adaptation of dose and interval to each patient is difficult to describe; but with a general knowledge of the action of I.K., and a critical survey of the case under treatment, it is fairly easy in practice. The following remarks on such types will be found instructive as regards their treatment, always bearing in mind the applicability of any scheme to the individual concerned.

I. In Early Febrile Cases (*Stage I*).

The early febrile case is best treated by enforcing absolute rest in bed, to limit auto-inoculation. With such treatment the temperature usually subsides to normal limits, with marked improvement in the condition of the patient. The time required for such a result to take place is extremely variable, depending on the severity of the process and the manner in which the patient reacts to his own poison. In some cases the temperature may remain elevated over a period of weeks, and show no signs of coming down : in such cases the daily variation tends to approach nil—the temperature assuming a flat look. It is in such protracted cases that I.K. is of benefit. Treatment may be given by the slow or rapid method of immunization, twice weekly in the former and once weekly in the latter, and pushed, if found beneficial to the patient as shown by an improvement in subjective signs. By watching the effect carefully, and paying strict attention in case of a lytic reaction supervening, the temperature will be found to fall, often quite dramatically. This treatment may be carried out in cases where rest cannot be enforced, as in dispensary practice, as well as with the patient in bed. *Chart XXXII* illustrates the condition in an ambulant case, while *Chart XXXIII* is that of a patient on absolute rest. It will be noticed that less time is taken when rest is enforced. When the dose required to cause the fall in temperature is reached, a severe local reaction, evidenced by swelling of the arm, often takes place.

2. In More Advanced Febrile Cases (*Stages II and III*).

Just as in early febrile cases, the ideal treatment for this class is absolute rest in bed. In dispensary work, however, one meets cases where, owing to conditions of housing,

poverty, or necessity to work, it is impossible to get the patient to go to bed, even where the urgency for such a proceeding is explained. Such cases are often bread-winners, men who are ardent workers, and who have no wish to go on 'benefit.' To try to enforce rest in bed by refusing to give dispensary treatment to such cases, simply means that no treatment of any kind will be obtained. The patient will go on his own way.

Without deprecating rest, I.K. will be found of marked utility in cases of this nature. Administration should be subcutaneous, as hypersensitiveness is uncommon in this class of case; if found beneficial, dosage should be pushed twice weekly by the gradual method until the requirements of the patient become known. In the treatment of this type of case I.K. must be regarded primarily as an antitoxic agent, its action in this capacity being often very pronounced. Accordingly, if the temperature shows any tendency to rise after a fall due to the antitoxic properties in a given dose, a further dose should be administered. In this way, by the continued exhibition of antitoxins, the temperature will be found to subside, and then the case can be treated as an ordinary afebrile or subfebrile one (*Charts XXXIV and XXXV*).

3. In Hectic Cases.

Cases showing 'septic fever,' with a great daily swing of about 4° F., require very careful treatment. Such cases are often hypersensitive to I.K. administered subcutaneously, although it is better to commence treatment by this route, in order to learn if such hypersensitiveness exists. If the patient is found to react too strongly to subcutaneous treatment, administration per os should be resorted to. Treatment commenced with Dilution VII on the

gradual method, with intervals of a week or more, will usually be found to be satisfactory, the prolonged interval allowing the poisoned organism to utilize any advantage derived from the given dose. Particular attention must be paid, however, to the temperature and the subjective symptoms of the patient. If the temperature is found to rise after a fall due to the administration, a further dose is indicated. By thus watching the effect of each dose, it will be discovered whether the administration should be made once or twice weekly, and also whether the gradual or the rapid method of immunization should be adopted. Theoretically it is desirable to push the dosage ; but from considerations of the severity of the disease, one has to be careful lest lytic reactions occur. It will be seen from the above that it is particularly in this class of case that treatment must be adapted to individual requirements. With careful administration it is in this type of case that the physician often meets with his most wonderful results. Following on the inception of treatment in a case which is responding, there is usually a marked improvement in both subjective and objective signs. The early anti-catarrhal effect of I.K. is particularly noticeable—a reduction in sputum, even by 50 per cent, sometimes taking place (*Chart XXXVI*).

4. In Bronchitic Cases.

Cases are met with having certain characteristics which are indicative of other organisms being at work besides the tubercle bacillus. These cases are definitely catarrhal, and clinically one would be justified in a diagnosis of bronchitis or bronchiectasis. The sputum is often abundant, and when examined microscopically in the ordinary way, stained by the Ziehl-Neelsen method, is usually negative.

Symptomatically, however, there are alarming symptoms such as night-sweats or haemoptysis, in addition to a long history, extending over years, in which is recorded the absolute failure of all methods of treatment. Moreover, in many cases where the patient is an adult with children, an examination of these as contacts will often reveal the tuberculous nature of the parental disease typically exemplified in them. Temperature data in bronchitic types yield little information from a diagnostic standpoint, as such data are extremely variable. In some the daily curve follows a normal type, whereas in others the morning temperature is elevated one day and low another, the continuous temperature record being decidedly irregular.

I.K. can be administered on either the gradual or rapid method in such cases, regard being paid more particularly to subjective signs and sputum measurements than to the temperature, which in this class is not a good indicator of the success or otherwise of treatment. In the treatment of this type of case the antitussive action of I.K. is very evident, showing the polyvalency of the preparation for organisms frequently associated with the tubercle bacillus. *Chart XXXVII* is illustrative.

5. In Cases with Inverted Temperature.

In rare instances cases are met with in which the morning temperature makes the highest daily register. These are usually difficult to treat, and are very often disappointing from the prognostic point of view. This inverted temperature due to the disease process must not be confounded with that occurring in persons who work during the night and sleep during the day. In such cases the temperature assumes a normal character on a return being made to opposite conditions of work and rest (*Chart XXXVIII*).

In cases with pathologically inverted temperature the administration of I.K. is of benefit. Treatment should be pushed rapidly—due regard being paid to the response evinced by the patient. In slight cases the rapid method of immunization should be used, whereas in severer types the gradual method twice weekly will be found more advantageous. Strange as it may seem, the temperature usually begins to show ordinary characteristics after the occurrence of a slight lytic reaction. Accordingly, in treating cases with inverted temperatures, the production of a slight lysis should be aimed at. Subsequent treatment should be carried out on the principles already laid down. An example is shown in *Chart XXXIX*.

ADMINISTRATION IN CHILDREN.

For the administration of I.K. in children, little requires to be added to what has already been said concerning adults. Even with the very youngest child found suitable, no difficulty need be experienced, as in such cases I.K. can be given per os. In older children the subcutaneous route may be employed. Generally it is better to proceed by the gradual method of immunization, giving the doses once weekly until a maximum is reached of from 0·3 of Dilution I to 0·3 of I.K. Original, depending on the result obtained, and the age and condition of the child.

In children showing continuously high fever, but who are otherwise in good general condition, it is advisable to push the administration as described under early febrile cases. In this way the toxæmia is reduced and finally entirely counteracted. In severe febrile cases where the child is very ill, slow procedure is required initially, doses

being limited to the lower dilutions, V, VI, and VII. Should benefit result, treatment can then be undertaken on the usual lines.

In the conditions of ill health following on whooping-cough, bronchopneumonia, etc., where catarrhal processes are left in the lungs as sequelæ, marked results may be obtained by the careful employment of I.K. Oral administration by the gradual method is indicated in the acute forms; whereas in the more chronic varieties the subcutaneous route can usually be adopted, and the dosage pushed by the gradual method twice weekly. As in the case of adult patients, however, the response must be closely watched, and the treatment suited to the requirements of the individual.

ADMINISTRATION IN PREGNANCY.

The incidence of a normal pregnancy in no way interferes with the exhibition of I.K. as a therapeutic measure in pulmonary tuberculosis.

Treatment in such cases is usually highly appreciated, and in dispensary work it is much against a patient's will to desist from attending in spite of gradually increasing difficulties. Even in advanced cases in Stage III, with abundant, positive sputum, marked results may be obtained. *Chart XL* shows such a result.

As pregnant cases often manifest a monthly rise in the temperature curve, corresponding to the menstrual rise of the non-pregnant condition, the physician must be careful not to confuse such elevations of temperature with those due to a slight lytic reaction.

EVIDENCES OF SUCCESS OR FAILURE OF TREATMENT.

The first signs of improvement in treatment with I.K. are subjective, and it is a fairly common occurrence for a patient to say how much better he feels even after the first administration. These subjective signs of improvement vary in different patients. In one, a feeling of well-being may be experienced—not the well-being of vigorous health, but a well-being relative to a former state of depression in some form or another: and being a relative state, its intensity is measurable only by reference to the preceding state. In others, an improvement such as an increased appetite for food is felt, or a lessening in the 'tightness in the chest.' Generally speaking, there is no analytical power in the majority of patients one has to deal with, and in answer to a leading question, "How are you to-day?" the reply, "I am much better," is indicative of an improvement in the chief symptom, without reference to any other symptom which may or may not be more alarming from the medical standpoint.

The feelings of the patient, however, form a substantial groundwork for a complete idea of the pathological condition as regards its activity, and any view which excludes subjective signs must be erroneous and misleading; in the treatment of a disease like pulmonary tuberculosis—a disease protracted and wearisome to the sufferer—it is the patient who is first able to discern the horizon of hope, even although it be sometimes illusory.

Apart from these indefinite signs of improvement, signs which are not readily recorded accurately by the physician, there are others of a more material nature. Foremost among these are the temperature data, which have already been considered with the routine administration of I.K.

The next most important observation is the amount of sputum. Liable as the expectoration is to large variations depending on external conditions of atmosphere, it does not, taken alone, form an accurate method of estimating the efficacy of treatment ; but considered along with other data, it is of very great value. For instance, taken in conjunction with an elevated temperature, headache, etc., it might indicate a lytic reaction which calls for care, although one must be careful to differentiate between a sputum increase due to a lytic reaction, and a simple increase due to a passing catarrh, which affects phthisical patients just as much as ordinary healthy individuals. One is apt to become alarmed at a sputum increase from $\frac{1}{2}$ oz. to 3 oz. when dealing with tuberculous patients, especially when one is in dread of lytic reactions ; but general reflection on one's own condition at the time of a common cold should make the phenomenon less disturbing. Under a later heading the special effect of I.K. on the sputum will be discussed ; at present it is sufficient to indicate the importance of sputum measurements as a guide to treatment.

The body weight may or may not increase simultaneously with the initial doses. While an increase is desired, a diminution in weight unaccompanied by other untoward signs should not be viewed with alarm, as under these circumstances at the commencement of treatment, it is indicative of no bad effect.

The pulse-rate should be carefully recorded. This should show a diminution in rapidity in cases where it was heretofore accelerated.

The foregoing observations have reference to the evidence of success or failure in the commencing stages of treatment. The same data hold good in later stages, but here other data are observable and of utility. Of additional subjective

signs may be noticed the absence of mental depression, nervousness, and vague feelings of losing all hold of life. The diminution in night sweats, headaches, dyspepsia, anorexia, etc., all point in the same direction, towards amelioration ; whilst objectively, body weight and sputum observations give evidence of improvement. In a case responding satisfactorily to treatment the temperature ultimately assumes a 'flat' aspect, with a daily variation of from $0\cdot2^{\circ}$ to $1\cdot0^{\circ}$ F. Such temperatures of complete immunization are shown in *Charts XLI* and *XLII*.

PROPHYLACTIC TREATMENT.

The protective immunizing property of I.K. has been shown by experiments on rabbits. These experiments, described by Fearis in *The Treatment of Tuberculosis by means of Immune Substances (I.K. Therapy)*, and quoted from *Carl Spengler: Tuberkulose- und -Syphilis-Arbeiten*, sufficiently indicate from a laboratory point of view the complete lytic-antitoxic immunity conferred by even such a minute dose as $0\cdot1$ c.c. of Dilution VI. As the main element in any anti-tuberculosis scheme lies in preventive measures, such experiments are of great value from the public health standpoint. Physicians see cases daily which cannot be definitely labelled as suffering from pulmonary tuberculosis—cases marked by debility, or a tendency to recurring colds, or some other complaint usually regarded as trifling—but which in the light of personal histories of other cases must be looked upon with alarm as very often prodromal evidence of severe disease. Many such cases are 'contacts' of definitely tuberculous patients, or even of such probably misnamed cases as asthma or chronic bronchitis. Very often the routine examination of these suspects reveals nothing of an objective nature on which

to base a diagnosis, which must accordingly rest entirely on subjective evidence or even on probabilities. In these circumstances it is wrong to wait for definite symptoms and signs to develop. The very fact that the patient is not right is the indication for treatment; moreover, in such cases treatment is usually simple in application and short in duration, as the rapid method of immunization will be found suitable in the majority of instances.

GENERAL REMARKS ON VARIOUS FORMS OF TREATMENT.

Treatment on an extensive scale may be divided into four forms : (1) *Dispensary*; (2) *Sanatorium*; (3) *Hospital*; (4) *Domiciliary*. Subdivisions, such as the open-air school and farm colony, exist, but it will be sufficient to indicate in a general way the value of I.K. in the four large groups.

I. In Dispensary Treatment.

Sufficient has been already said to show the value of I.K. in dispensary practice, where all varieties of patients are met with. Its applicability to the early as well as to the advanced case, afebrile or febrile, gives it a range particularly suitable for use in dispensary work—a range which is denied to tuberculin. Moreover, the rapidity with which its effectiveness is displayed raises a hopefulness in the patient, who, being unable to appreciate readily the protracted nature of ambulant treatment, is apt to regard any method with suspicion if good results are not quickly forthcoming. Again, being non-toxic and, when given properly, free from any of the sequelæ which threaten to follow the administration of tuberculin, I.K. becomes of marked value in the treatment of patients who are at work. In

dispensary practice many patients are met with in whom the administration of tuberculin is contra-indicated for some reason or other, and who, if tuberculin is the only therapeutic agent used, must be denied any treatment of a specific nature. In such cases I.K. has been shown to be of service. Its use therefore enlarges the scope of ambulant treatment, and makes the dispensary a unit of increased value in any anti-tuberculosis scheme.

2. In Sanatorium Treatment.

The value of I.K. is not so readily appreciated in sanatorium practice as in dispensary work. Under hygienic-dietetic treatment, as carried out at a sanatorium, the patient is removed from the harmful surroundings which aided the development of his diseased condition, and is placed in the best possible environment, where rest and exercise are carefully watched, where proper food is given, where the importance of fresh air is recognized, and where there is constant medical supervision. Treatment on these sanatorium lines alone is in many cases sufficient to improve the condition of the phthisical patient, so that when any supplemental treatment such as I.K. is given, there is a difficulty in separating for statistical purposes the amount of good occurring from the respective methods.

It would appear from the above observation that the relative merits or demerits of any given specific treatment must be ultimately proved in dispensary work. No matter how one may arrange 'controls' in sanatorium treatment, there is still the overlapping factor, and control cases and specifically treated cases are not absolutely alike. It is in dispensary practice that specific treatment is seen in operation alone, or virtually alone. The patient remains in his natural environment, and although this is somewhat

improved by following advice regarding rest, ventilation, food, etc., the change is of a much less marked nature than that obtained by transferring a patient to a sanatorium.

The question at issue, however, in no way affects the position of I.K., for if it is found of utility in dispensary practice, one must assume its value when combined with what in reality one aims at obtaining in ambulant treatment. The all-important point which distinguishes proper sanatorium treatment from dispensary treatment is the constant medical supervision exercised in the former. It is this supervision which constitutes a sanatorium what it is, and places it beyond the limits of a convalescent home. Owing to this factor, sanatorium observations should far outweigh many of those obtained at a dispensary, where necessarily much that is required for statistical and scientific purposes is observed and recorded by the patients themselves. In the matter of sputum measurements, for instance, it is exceedingly difficult in dispensary work to obtain records of a sufficient accuracy from which to tabulate results. Certainly the patient observes, but it is an observation which finds expression in such statements as 'Spitting more,' 'Spitting less,' or 'No spit.' Again, in dispensary work, observations concerned with the blood, the pulse, the diseased focus, etc., following an administration of I.K. must for obvious reasons be omitted. In these respects the dispensary physician is at a loss in estimating the complete value of I.K., and must look to his sanatorium colleague for the complementary evidence required.

3. In Hospital Treatment.

Although hospital treatment is meant primarily for the hopeless and dying, cases are met with which, under the

hygienic-dietetic life, begin to regain ground considered at first as absolutely lost, and who are ultimately able to be transferred to a sanatorium. While in the treatment of such advanced cases general measures must predominate, there is no doubt that the careful exhibition of I.K. is productive of great good. Its antitoxic quality makes it eminently suitable for administration to an already toxin-saturated body; as has already been indicated, it is often from among his advanced and generally considered hopeless cases that the physician experienced in I.K. therapy obtains his most striking results. It has also been pointed out that I.K. often produces a rapid subjective improvement; and even if nothing else than this were achieved in the treatment of the advanced case, the production of a feeling of well-being would be no small gain.

4. In Domiciliary Treatment.

Under the Sanatorium Benefit Schemes which are in operation under the Insurance Act, the domiciliary treatment of phthisical patients has become of much importance, and there is an ever-growing responsibility thrown on the general practitioner regarding his treatment of such domiciliary cases. Hitherto, with few exceptions, specific treatment has been confined to specialists in that particular department; and practitioners have aided this restriction by quite a legitimate fear of specific therapy. The advent of I.K., however, opens up a further field in domiciliary treatment, whether being given to early febrile or to very advanced cases. Relative to tuberculin, it is simple in its application: moreover, there is no reason to think that it will ever assume the polymorphous characteristics of tuberculin treatment, which in a great many instances is carried out in the most heartrendingly haphazard manner, and with

a peculiar absence of imagination. Under such circumstances it is much better for those who are concerned with the ultimate value of specific treatment, that tuberculin be left in the hands of a few ; but, on the other hand, there seems no reason why I.K. should not be productive of good when used in general practice, if a careful consideration of the first principles of I.K. therapy be made. It is the general practitioner who is the outpost in the campaign against tuberculosis in all its forms. It is he who is first brought into contact with the case as an individual requiring treatment, and on his diagnostic skill depends in great measure the chances of the patient. Leaving aside cases of certain tuberculosis, he is in daily touch with 'contacts,' and able to observe any showing signs of ill health, malnutrition, or a tendency to 'colds' and many other symptoms which, from a consideration of after-histories, are important prodromal manifestations of a tuberculous process. Consequently, for the practitioner to use I.K. in such a pre-tuberculous class would be an all-important aspect in any anti-tuberculosis scheme, and would relieve the specialist of much time which could be devoted to cases of a more difficult nature.

EFFECT OF TREATMENT ON BODY WEIGHT.

Of objective data indicative of success in the treatment of pulmonary tuberculosis, the weight of the body claims a prominent position, especially when treatment is being carried out while the patient remains at home in his ordinary surroundings. In the following table (*Table I*) an effort has been made to gauge the effect of I.K. in this capacity. There were 45 cases taken—15 in Stage I, 15 in Stage II, and 15 in Stage III. They were of both sexes

Effect of Treatment on Body Weight

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Table I.

	STAGE I		STAGE II		STAGE III	
	At end of 7 days	At end of 28 days	At end of 7 days	At end of 28 days	At end of 7 days	At end of 28 days
	lb.	lb.	lb.	lb.	lb.	lb.
1	$\frac{1}{4}$	$4\frac{1}{2}$	$3\frac{1}{4}$	5	$2\frac{3}{4}$	$3\frac{1}{4}$
2	-1	$-\frac{3}{4}$	$3\frac{1}{2}$	$7\frac{1}{2}$	-2	1
3	$2\frac{1}{2}$	$-2\frac{1}{4}$	0	$1\frac{1}{4}$	2	$2\frac{1}{2}$
4	$\frac{1}{4}$	$1\frac{1}{2}$	$-\frac{3}{4}$	$\frac{1}{2}$	1	$1\frac{1}{4}$
5	$\frac{3}{4}$	$-\frac{3}{4}$	$\frac{1}{4}$	1	$\frac{1}{4}$	$-\frac{3}{4}$
6	$-\frac{1}{4}$	$-\frac{1}{4}$	$\frac{3}{4}$	-2	-1	$-\frac{3}{4}$
7	$\frac{1}{4}$	1	$-\frac{1}{4}$	$-\frac{3}{4}$	$\frac{1}{2}$	$1\frac{1}{4}$
8	$-\frac{1}{2}$	3	$\frac{1}{4}$	$-\frac{3}{4}$	$1\frac{1}{4}$	1
9	2	$1\frac{1}{2}$	$1\frac{1}{2}$	1	$2\frac{3}{4}$	$3\frac{3}{4}$
10	$-1\frac{1}{4}$	-1	$-\frac{1}{2}$	$-\frac{3}{4}$	-1	2
11	$\frac{1}{4}$	$1\frac{3}{4}$	$\frac{1}{2}$	1	$-\frac{1}{2}$	$-\frac{1}{2}$
12	0	1	$\frac{1}{4}$	$4\frac{1}{4}$	$\frac{1}{4}$	1
13	$\frac{1}{2}$	$1\frac{3}{4}$	$\frac{3}{4}$	2	$3\frac{1}{2}$	$5\frac{3}{4}$
14	$\frac{3}{4}$	1	$\frac{1}{4}$	$1\frac{1}{4}$	$-\frac{1}{4}$	$\frac{3}{4}$
15	$\frac{1}{4}$	1	$-\frac{1}{2}$	$1\frac{1}{4}$	$\frac{1}{4}$	$4\frac{1}{2}$
Total gain	$7\frac{3}{4}$	18	$11\frac{1}{4}$	26	$14\frac{1}{2}$	28
Total loss	-3	-5	-4	-54	$-4\frac{3}{4}$	-2

These results may be analyzed as follows:—

Average gain in weight of all cases at end of first week 77 oz.

Average gain in weight of all cases at end of first four weeks 21.2 oz.

A further analysis, according to the stage of the disease, is given in the following table (*Table II*):—

Table II.

Stage I	AVERAGE GAIN IN WEIGHT AT END OF 7 DAYS		AVERAGE GAIN IN WEIGHT AT END OF 28 DAYS		
	Stage II	Stage III	Stage I	Stage II	Stage III
oz.	oz.	oz.	oz.	oz.	oz.
5.0	8.2	10.4	13.8	22.1	27.7

and of all ages, and treatment was carried out while they remained in their ordinary surroundings and under the worst of hygienic conditions to be found in a densely populated mining area. Moreover, the patients were either insured persons or the dependants of insured persons, and accordingly in many instances unable to procure sufficient and proper nourishment owing to their relative poverty. For each stage-group there are two columns, one giving the increase or decrease in weight at the end of the first week of treatment, and the other at the end of four weeks. These two periods have been selected for the following reasons :—

1. They cover a preliminary or experimental period of four weeks.
2. No other treatment, such as cod-liver oil or extra nourishment, is given during this preliminary period.
3. Being a preliminary period, there is no selection of cases as to suitability or otherwise, although of course if the case is found eminently unsuitable after the first dose (severe lysis or hypersensitiveness), treatment is stopped.

Although the figures in the table have all the faults of a short series, the data show a marked and significant tendency in one direction. Of especial importance is the average gain in weight for the 45 cases taken as a whole for the two periods of one week and four weeks, without any reference to age, sex, or stage distribution. Considering the adverse conditions of the patients, and the entire impossibility of attributing the increase in weight to hygienic-dietetic measures, one can only conclude that the I.K. procured the improvement.

From *Table II* it would appear that I.K. exerted a more marked benefit in Stage III than in Stage I or II, and that Stage II cases did better than those in Stage I. The reason

is that the more advanced the disease, the greater is the relative contrast between the condition present and that existing in approximate health, so making the improvement which sets in all the more appreciable; in other words, as far as weight is concerned, the Stage III case has the greatest range in which to manifest improvement.

EFFECT OF TREATMENT ON SPUTUM.

The importance of measuring the daily amount of sputum has been already mentioned as significant in indicating success or failure of treatment. In dispensary practice, however, the difficulty of getting patients to be accurate with their expectoration is very great, due to the long period in which many of them have exercised no control over its disposition, or to having become accustomed to spitting in a paper and then burning it. Consequently, the statistics which follow regarding this aspect of I.K. therapy are extremely scanty (*Table III*), for only the cases which showed any degree of accuracy in sputum observation were selected. All were Stage III cases (Turban-Gerhardt) with tubercle bacilli present in the sputum. The treatment was carried out ambulantly at a dispensary. The period of twenty-eight days has been selected in order to show the rapidity with which I.K. exerts its anti-catarrhal effect, as in the majority of cases the greatest reduction in sputum takes place at the commencement of treatment. It is the residue of sputum—often a small amount, such as a quarter-of-an-ounce, or a morning spit—which is difficult to remove, and, indeed, in many cases one is led to the conclusion that such a residual sputum is in no way connected with the tuberculous process, but is dependent on other causes, such as the vitiated atmosphere of an industrial area. Although no observations have been made on the

disintegrative effect of I.K. on tubercle bacilli, a total disappearance has been noted. Even where such a good result cannot be obtained, it is fair to assume that by reducing the amount of sputum, the number of bacilli expectorated will be also reduced—especially where a total disappearance of sputum has been effected.

Table III.

	AMOUNT OF SPUTUM AT THE COMMENCEMENT OF TREATMENT	AMOUNT OF SPUTUM AFTER 28 DAYS' TREATMENT	DIFFERENCE	
			Diminution	Increase
I	5	1 1/4	3 3/4	—
2	2	2	—	—
3	5 1/2	3	2 1/2	—
4	1 1/2	1	1/2	—
5	4	4	—	—
6	6	1	5	—
7	1/2	1/2	—	—
8	4	4	—	—
9	1 1/2	1 1/2	—	—
10	3	1 1/2	1 1/2	—
11	2 1/2	1/2	2	—
12	1/2	1/4	1/4	—
13	2	2 1/2	—	1/2
14	2	1 1/2	1/2	—
15	2	2	—	—
16	5	1 1/4	3 3/4	—
17	1/4	1/4	—	—
18	1/2	3	—	2 1/2
19	2 1/2	2	1/2	—
20	1 1/2	1	1/2	—
21	1/2	1/4	1/4	—
22	6	1/2	5 1/2	—
23	6	6	—	—
24	1 1/2	1/2	1	—
25	4	4	—	—

These results may be analyzed as follows :—

In 56 per cent the sputum diminished—on an average by 1.96 oz.

In 8 per cent the sputum increased—on an average by 1.5 oz.

In 36 per cent the sputum remained stationary.

By a continuation of treatment, the percentage of cases in which the sputum remains the same after twenty-eight days' treatment will be greatly lessened, as in some instances it is only by using the higher doses that the anti-catarrhal effect of I.K. becomes evident. The cases manifesting an increase, however, are usually found disappointing.

EFFECT OF TREATMENT ON FEVER.

The antifebrile action of I.K. has already been remarked on under different headings in the foregoing. An endeavour will now be made to show this action in tabular form.

Table IV.

	HIGHEST TEMPERA-TURE DURING WEEK PRECEDING TREATMENT Degrees (F.)	HIGHEST TEMPERA-TURE DURING WEEK AFTER 28 DAYS' TREATMENT Degrees (F.)	DIFFERENCE	
			Reduction Degrees (F.)	Elevation Degrees (F.)
I	100.0	100.0	—	—
2	99.8	100.4	—	0.6
3	100.0	98.6	1.4	—
4	99.6	99.2	0.4	—
5	100.6	100.6	—	—
6	99.8	99.0	0.8	—
7	100.4	100.0	0.4	—
8	100.4	99.4	1.0	—
9	101.4	101.4	—	—
10	102.0	99.8	2.2	—
11	101.0	99.0	2.0	—
12	100.6	100.8	—	0.2
13	101.0	99.0	2.0	—
14	100.6	102.4	—	1.8
15	100.6	98.4	2.2	—
16	102.6	101.2	1.4	—
17	100.2	99.0	1.2	—
18	100.0	99.6	0.4	—
19	101.0	101.0	—	—
20	99.8	99.8	—	—

These results may be analyzed as follows :—

In 60 per cent the fever was reduced—on an average by 1.3°.

In 15 per cent the fever was elevated—on an average by 0.8°.

In 25 per cent the fever remained stationary.

In *Table IV* (page 49) data concerning a series of twenty cases are given. All were advanced Stage III cases, with tubercle bacilli present in the sputum, and manifesting some degree of fever. Treatment was carried out ambulantly at a dispensary. It is hoped that the restriction to such a type of case, undergoing the least suitable treatment, will enhance the value of the results obtained, despite the shortness of the series observed. Furthermore, it should be noticed that the results are those derived from twenty-eight days of treatment. This period has been chosen mainly because of the freedom from other concomitant treatment, and also because the shorter the time taken the more readily demonstrable must the antifebrile action of I.K. be. The temperatures are Fahrenheit—taken orally. Owing to the daily variations in temperature, some difficulty was experienced in estimating the degree of fever present. Accordingly, for tabular purposes the highest record was taken (1) of the week preceding treatment, and (2) of the week after twenty-eight days of treatment. It should be noted that these are not final results. In many of the cases where the temperature remained stationary or became elevated, improvement set in on further treatment being pursued.

ECONOMIC ASPECT OF TREATMENT.

The expensiveness of present-day tuberculosis treatment on a national scale is a point very often raised in criticism, and especially so with regard to sanatorium treatment. Towards dispensary treatment a greater leniency has been shown; but there is ample reason to believe that with the increasing demand for treatment which will result from a growing public and medical consciousness of the gravity of

the situation, the economic aspect of all forms of treatment will ultimately be brought into greater prominence.

The question will then obtrude itself: Which kind of treatment is the most rapid and at the same time the most effective, for if rapidity and effectiveness can be combined, then this treatment must in the long run be the cheapest? Attention has already been called to the rapidity with which I.K. exerts a beneficial effect in suitable cases, and with increasing knowledge of the administration of the treatment, one may look for an ever-widening field of application. Authors have shown that I.K. treatment is more rapid and more effective in its action than either sanatorium treatment or sanatorium and tuberculin treatment combined, but at present it is too early to be dogmatic, especially when neither sanatorium nor tuberculin treatment is a definitely stable quantity. It seems essential that sanatoria should exist, for there are many cases suitable for no other kind of treatment, needing as they do strict discipline in every department of their lives to effect a good result. Again, tuberculin applied either in sanatorium or dispensary treatment will—when its indiscriminate use has gone, carrying along with it all the untoward results derived from the practice—continue to hold its own as a therapeutic measure of the utmost value in special cases. With the more extensive use of I.K., however, the time taken by either dispensary or sanatorium methods will in the majority of cases be diminished, and in this way there will be a financial saving. Not only with regard to dispensary and sanatorium treatment will this diminished expenditure be apparent. Considering the applicability of I.K. to the very earliest suspicious cases, and also to the fairly advanced Stage III cases, a saving will result in the first group by increased

prevention of the disease, and in the second by a more thorough and satisfactory domiciliary treatment. As it is from such domiciliary cases that hospital patients are recruited, it may be hoped that improved treatment carried out at home will be followed by a reduction in hospital expenditure.

RESULTS OF TREATMENT.

It is extremely difficult to give statistics of results in the treatment of a disease like pulmonary tuberculosis. While no doubt need be felt when a patient has become worse or has died, there must necessarily be hesitation in saying a person has been cured. Indeed, to use the word cure in connection with pulmonary tuberculosis, is unwarrantable in the present condition of our knowledge; and in gauging the efficacy of any treatment such as I.K., one must recollect the great tendency of the disease to arrest itself spontaneously.

Apart, however, from statistical data, there are several points one may mention which are of interest. The treatment is appreciated by the patients. They feel the benefit of it, and are ready to acclaim its efficacy in no uncertain way. Should any contra-indication arise, and it is decided not to give a dose, there is always the look of disappointment; and there is great difficulty in convincing the patient that it is for the best. Attendance for treatment is usually regular and prompt, and the fact that many of the patients persist in coming for treatment in spite of insufficient means, is surely an indication that I.K. has in their view some intrinsic value; and, after all, it is the patient who is the final judge.

It is, however, on clinical evidence that any treatment must stand or fall, and therefore the following summary

of cases treated is given (*Table V*). It should be observed that in its compilation no particular selection has been made, all cases receiving more than six doses being recorded. The table includes patients treated ambulantly since October, 1913, with the 'general result' brought up to January, 1916. While this does not allow sufficient time since the cessation of active treatment to gauge the full value of I.K., it is yet hoped that the consideration of the results as a whole will prove helpful in the just appraisement of the treatment carried out.

Other cases belonging to the same time-group, but who received sanatorium or hospital treatment in addition to dispensary treatment, have been left out. A further group treated in a previous period of six months has also been omitted, as the treatment was carried out at a sanatorium, thus introducing an obvious difficulty in estimating the value of I.K.

I.K. Therapy in Pulmonary Tuberculosis

Table V.—SUMMARY OF CASES.

No.	AGE	SEX	STAGE *	MODE OF ONSET	SYMPTOMS ON ADMISSION	DOSE	SYMPTOMS ON DISCHARGE	GENERAL RESULT	FEVER *
1	11	M.	II	B	Cough 9 months	20 per os	None ...	A	Well and at school 17 months after treatment
2	48	M.	III	C	Pleurisy 1 year	25	Spit, reduction from 3½ oz. to 1½ oz. ...	A	Fairly well and doing light work 10 months after treatment
3	32	F.	I	B	Pleurisy 6 m'ths, bronchitis 2 y'rs	15	None ...	A	Well and working 21 months after treatment
4	27	M.	III	B	Haemoptysis 5 months	18	None ...	A	Well and working 21 months after treatment
5	35	F.	II	C	Tiredness, cough 6 months	9	Spit, reduction from 6 oz. to ½ oz.	C	Died in childbirth 2 months after treatment
6	41	M.	III	C	Haemoptysis, pleurisy 12 y'rs	39	Spit, reduction from 2 ozs. to nil. Patient worked during whole course of treatment	B	Well and working 6 months after treatment
7	36	F.	II	B	Cough 3 years	23	Cough and spit occasional	A	Well and working 18 months after treatment

Summary of Cases

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8	20	M.	C	I	Cough, pleurisy 3 yrs	Cough, spit, haemoptysis, night sweats, debility	11	None ..	B	Well and working 15 months after treatment
9	15	M.	III	B	Pleurisy 2 years, cough 3 m'ths	Cough, spit, night sweats, debility	15	None ..	A	Well and working 17 months after treatment
10	15	M.	III	C	Pleurisy 4 years, cough 3 m'ths	Cough, spit, night sweats. Tuberle bacilli present	35	Cough and spit. Tuberle bacilli present. Patient worked during whole course of treatment	A	Fairly well and working 7 months after treatment
11	54	F.	III	C	Pleurisy 2 years, haemoptysis 2 years	Cough, spit, haemoptysis, extreme debility. Tuberle bacilli present	9	Cough, spit, no further haemoptysis	C	If anything slightly better 16 months after treatment
12	20	F.	II	B	Cough. (Sister has advanced phthisis)	Cough, spit, night sweats	12	None ..	A	Well and working 16 months after treatment
13	12	F.	II	C	Pleurisy on admission 1 week	Pleurisy ..	13	None ..	B	Well and at school 13 months after treatment
14	12	F.	III	B	Hæmoptysis, cough 2 years	Cough, spit 2 oz., night sweats, pain	19	Slight spit ..	A	Slight spit, otherwise well and working 18 months after treatment
15	14	F.	III	C	Pneumonic phthisis 4 yrs	Cough, spit, haemoptysis, night sweats, debility, hoarseness. Tuberle bacilli present	20	Slight improvement generally	C	Patient died 8 months after treatment
16	14	F.	I	B	Cough 10 years	Cough, spit, pain, shortness of breath	21	None ..	B	Well and working 13 months after treatment

I.K. Therapy in Pulmonary Tuberculosis

Table V.—SUMMARY OF CASES—*continued.*

No.	AGE	SEX	STAGE *	FEVER *	MODE OF ONSET	SYMPOMS ON ADMISSION	Dose	SYMPOMS ON DISCHARGE	FEVER *	GENERAL RESULT
17	21	M.	I	B	Influenza 3 m'ths	Cough, spit, night sweats, and pain. Tubercle bacilli present	6	None ..	A	Well and working 15 months after treatment
18	35	F.	II	C	Cough 6 months	Cough, spit, night sweats, pain, loss in weight, debility	17	Shortness of breath, spit $\frac{1}{2}$ oz.	A	Well and working 14 months after treatment
19	17	F.	I	C	Cough, spit 2 months. (Sister has advanced phthisis)	Cough, spit, loss in weight, debility	17	None ..	A	Well and working 14 months after treatment
20	29	M.	II	B	Pleurisy 6 weeks	Cough, spit $1\frac{1}{2}$ oz., night sweats, loss in weight. Tubercle bacilli present	24	Spit $\frac{1}{2}$ oz.	B	Well and working 9 months after treatment
21	35	M.	III	B	Pleurisy $2\frac{1}{2}$ years	Cough, spit, haemoptysis, night sweats. Laryngeal. Tubercle bacilli present	17	Much improved, cough and spit the same	A	No change 15 months after treatment. Not working
22	36	F.	I	C	Pleurisy 7 years	Cough, spit, night sweats	16	None ..	A	Well and working 13 months after treatment
23	46	M.	III	A	Pneumonia three times	Cough, spit, shortness of breath, debility. Unable to work	21	None ..	A	Well and working 8 months after treatment. Died of tonsillitis
24	9	F.	I	B	Pleurisy 4 years, also 6 weeks	Cough, night sweats, shortness of breath	31	Slight cough, pain left side	A	Well and at school 18 months after treatment

Summary of Cases

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25	9	M.	II	C	Night sweats 3 years, cough 2 years. (Sister has advanced phthisis)	Cough, night sweats, shortness of breath, debility	15 per os	None	B	Well and at school 14 months after treatment
26	28	F.	III	B	Tiredness 3 y'rs, cough	Cough, haemoptysis, debility	17	None ..	..	B	Well and working 14 months after treatment
27	13	M.	I	A	Cough, debility. (Father advanced phthisis)	Cough, pleurisy, debility	19	None ..	..	A	Well and working 9 months after treatment
28	40	M.	III	C	Pleurisy, tuberculous pneumonia 3 years	Cough, spit, haemoptysis, night sweats, loss in weight, extreme debility. Tubercle bacilli present	10	No improvem't in symptoms	..	C	Patient died 21 m'ths after treatment
29	9	F.	III	C	Cough 18 m'ths, influenza 3 y'rs	Cough, spit, night sweats, shortness of breath	26	None ..	..	B	Well and at school 18 months after treatment
30	13	F.	III	A	Tiredness 1 year, cough 3 weeks	Cough, spit, night sweats, loss in weight, pain in chest, debility	16 per os	None ..	..	A	Well and working 12 months after treatment
31	35	M.	III	C	Pleurisy, cough	Cough, spit, night sweats, shortness of breath.	34	Cough, spit, only slight shortness of breath	..	A	Fairly well, but not working, 7 months after treatment
32	40	M.	III	C	Pain in chest, pleurisy 3 m'ths	Tubercle bacilli present	15	No improvem't in symptoms	..	B	Patient gradually getting worse 14 m'ths after treatment
33	30	M.	I	B	Pleurisy, haemoptysis 3 weeks	Cough, spit, haemoptysis, night sw'ts, shortness of breath	19	None ..	..	B	Well and working 6 months after treatment

I.K. Therapy in Pulmonary Tuberculosis

Table V.—SUMMARY OF CASES—*continued.*

No.	AGE	SEX	STAGE *	FEVER *	MODE OF ONSET	Symptoms on Admission	Dose	Symptoms on Discharge	FEVER *	GENERAL RESULT
34	43	F.	II	B	Pleurisy. (Husband died of phthisis)	Cough, pain in chest, shortness of breath, loss in weight	18	Slight pain in chest	B	Well and working 6 months after treatment
35	35	F.	II	B	Recurring influenza, bronchitis	Cough, shortness of breath, debility	20	None ..	A	Well and working 20 months after treatment
36	13	M.	I	B	Pleurisy 2 m'ths	Pain in chest	26	None ..	A	Well and working 22 months after treatment
37	17	M.	II	B	Bronchitis 3 months, pleurisy 1 month	Cough, spit, night sweats	20	None ..	A	Well and working 9 months after treatment
38	12	F.	II	C	Cough, pleurisy 3 years	Cough, spit, night sweats, pain in chest, debility	16	None ..	B	Well and at school 7 months after treatment
39	29	M.	II	B	Cough, spit 1 month. (Brother died of phthisis)	Cough, spit, night sweats. Tubercle bacilli present	22	None. Tubercle bacilli disappeared in 4 months. No spit whatever at end of treatment	B	Well and working 6 months after treatment; no spit
40	20	F.	I	B	Cough, haemoptysis 3 m'ths	Cough, haemoptysis	18	Slight cough	B	Well and working 8 months after treatment
41	10	F.	II	B	Tiredness 8 w'ks, pleurisy 3 w'ks, haemoptysis 3 weeks	Cough, haemoptysis, shortness of breath, loss in weight	17	None ..	A	Well and at school 7 months after treatment

Summary of Cases

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42	12	M.	I	C	Pain in chest 10 weeks. (Mother has advanced phthisis)	Cough, spit, night sweats, pain in chest	48	None	A	Well and at school 8 months after treatment
43	45	M.	I	B	Pleurisy 2 years, haemoptysis 8 months	Cough, spit, haemoptysis, pain in chest	18	None ..	..	A	Well and working 7 months after treatment
44	15	F.	II	B	Cough, spit 8 years	Cough, spit, haemoptysis, pain in chest, loss in weight	24	Cough and spit, otherwise general improvement		B	Fairly well and working 7 months after treatment. Bronchiectasis
45	15	M.	I	A	Recurring colds with much spit	Cough, spit, night sweats, pain in chest	16	None, sputum reduced from $1\frac{1}{2}$ oz. to nil	..	A	Well and working 6 months after treatment
46	23	M.	I	A	Influenza, pleurisy 12 weeks	Cough, pain in chest, shortness of breath	9	None ..	..	A	Well and working 7 months after treatment
47	16	M.	I	B	Bronchial symptoms 2 years	Cough, spit, night sweats	12	None ..	..	A	Well and working 7 months after treatment

* The stage distribution is that of Turban-Gerhardt; the fever distribution that of Spengler.

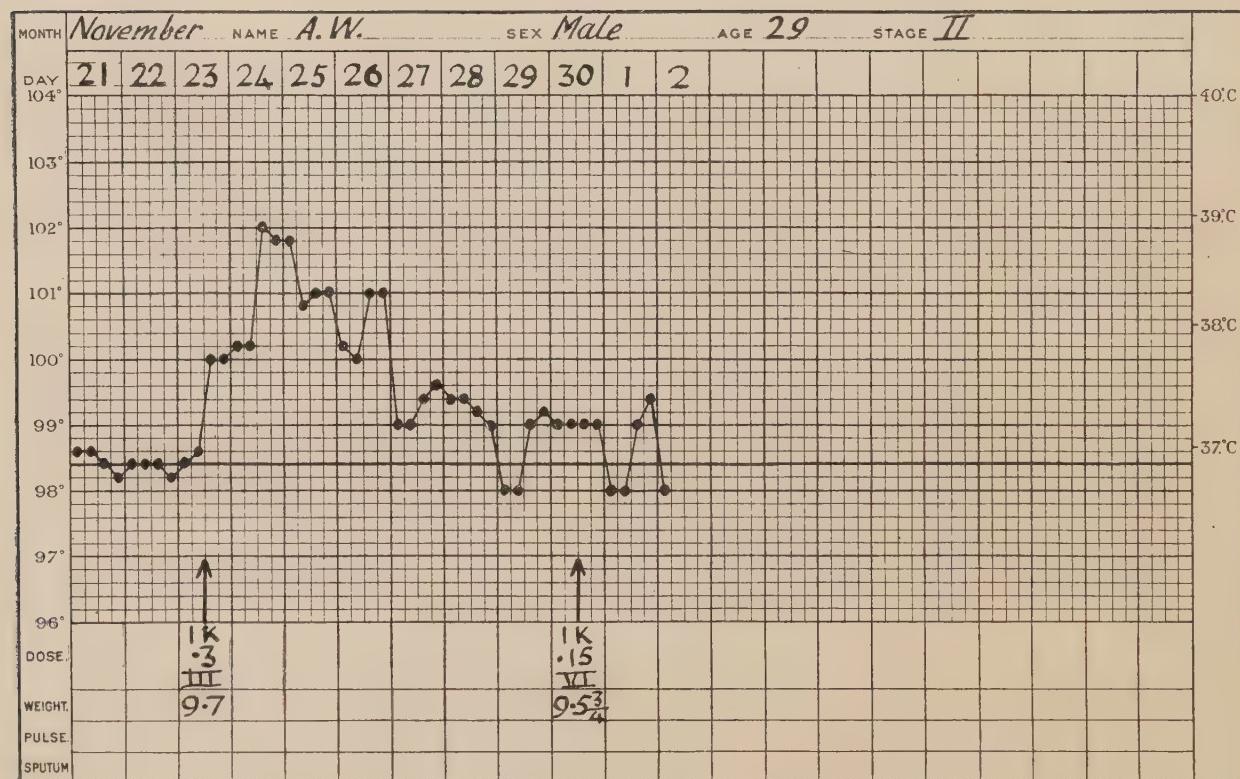
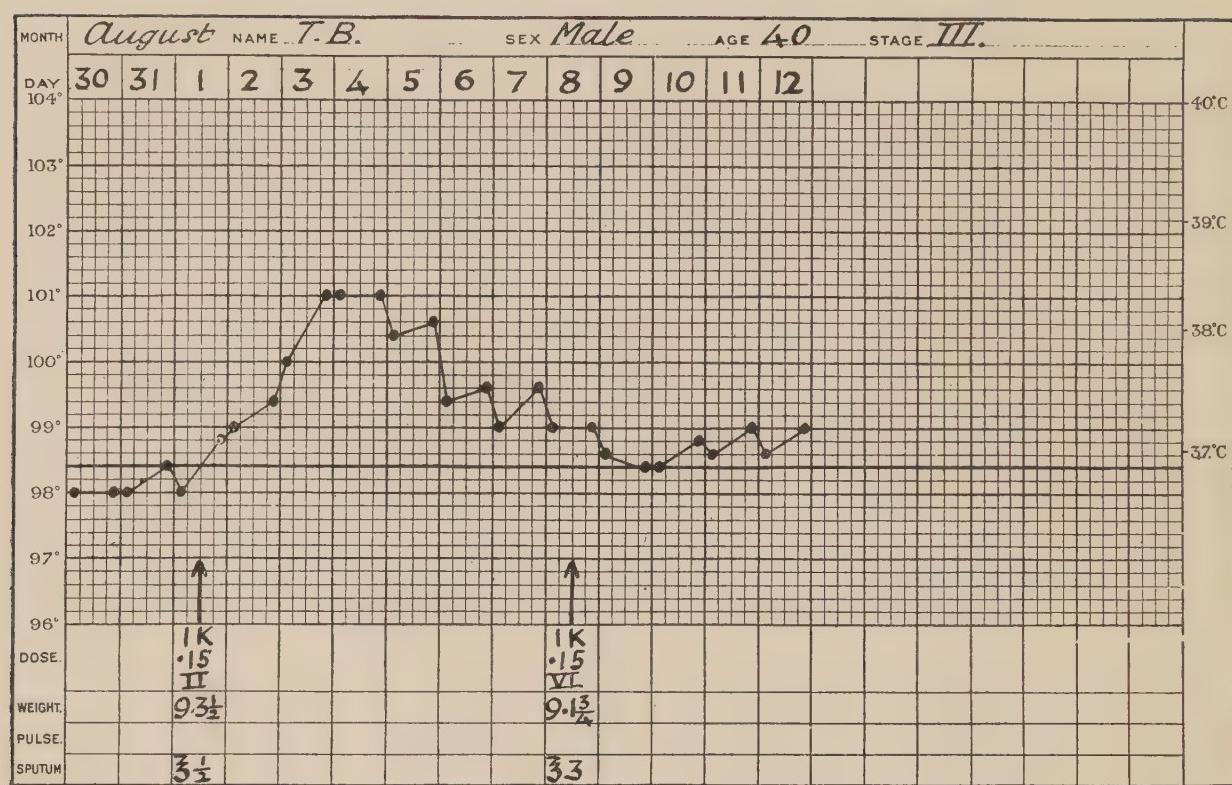
CHARTS

EXPLANATORY NOTE.

The method of administration is indicated as follows :—

Subcutaneously	-	-	-	↑
Orally	-	-	-	○

I.K. Therapy in Pulmonary Tuberculosis



Charts

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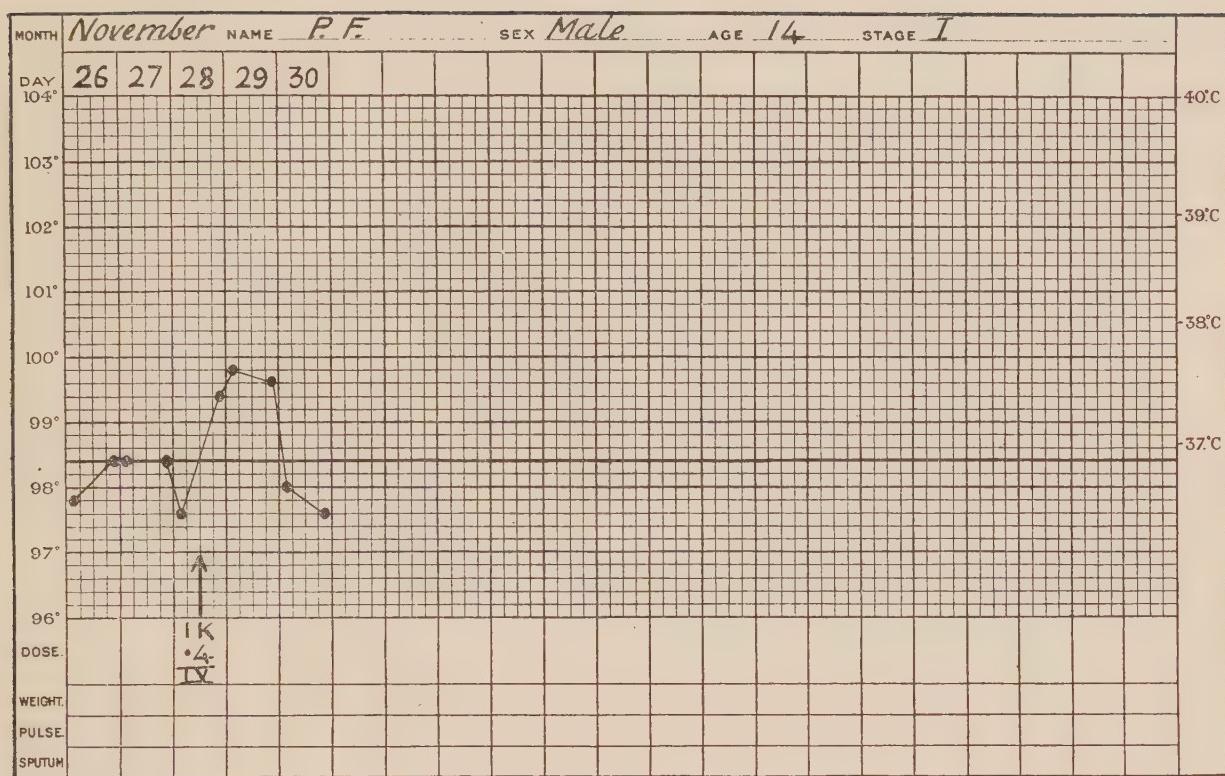


CHART III.

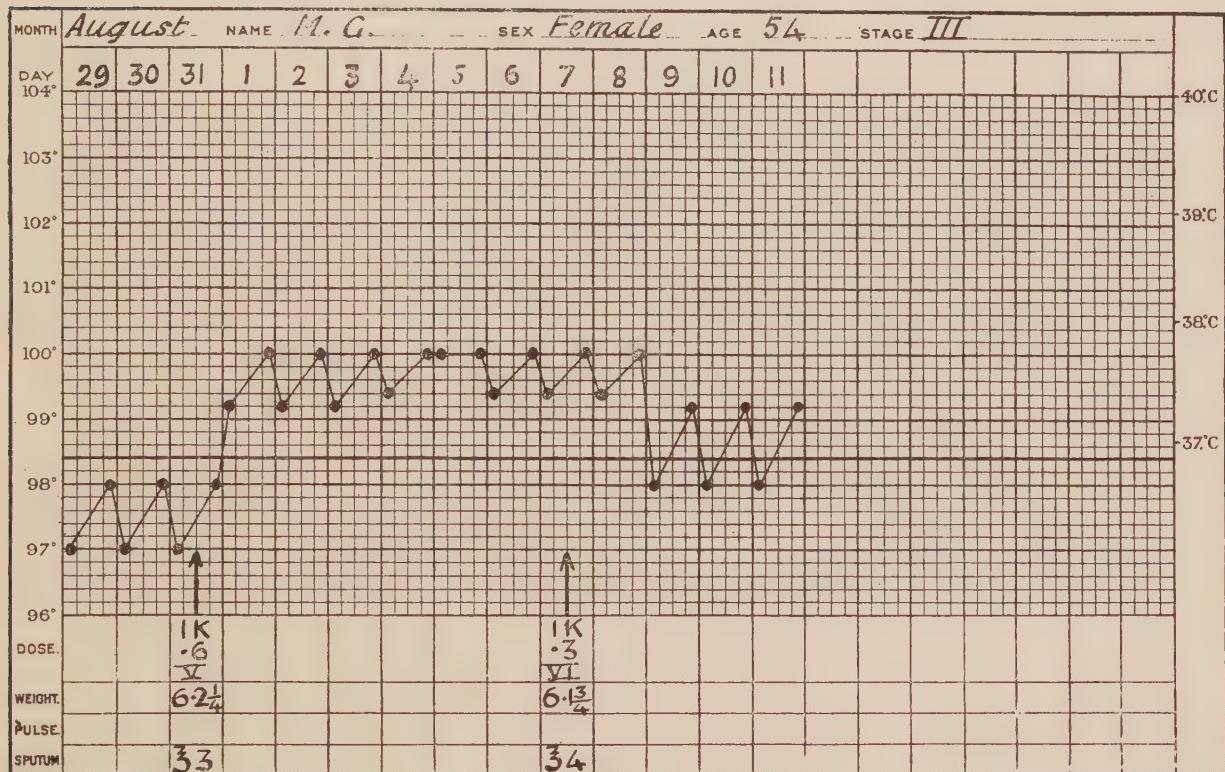


CHART IV.

I.K. Therapy in Pulmonary Tuberculosis

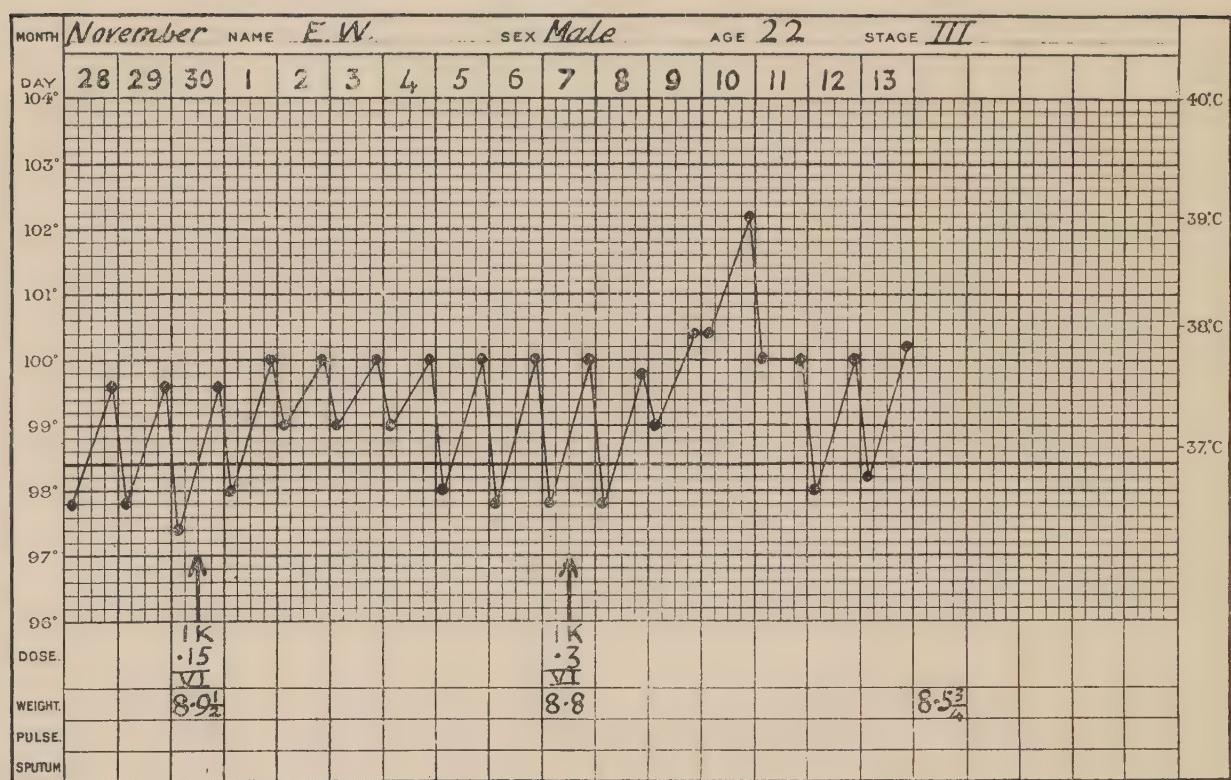


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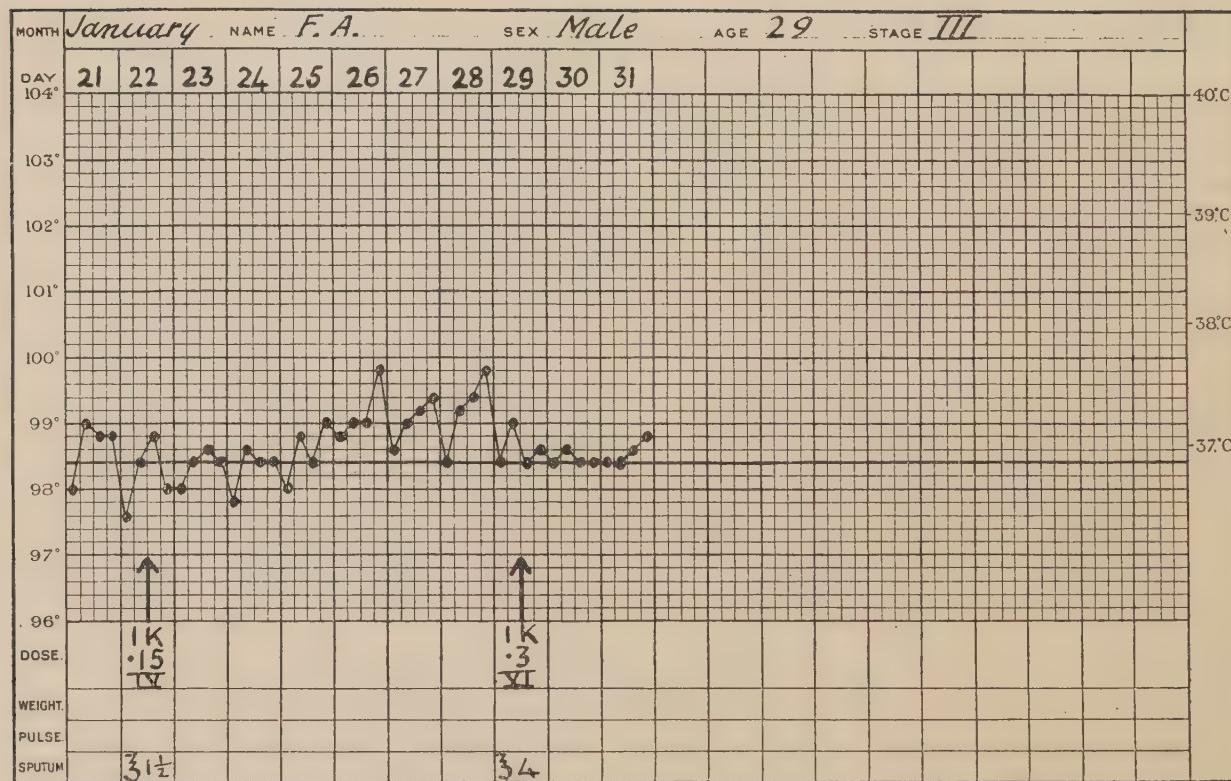


CHART VI.

Charts

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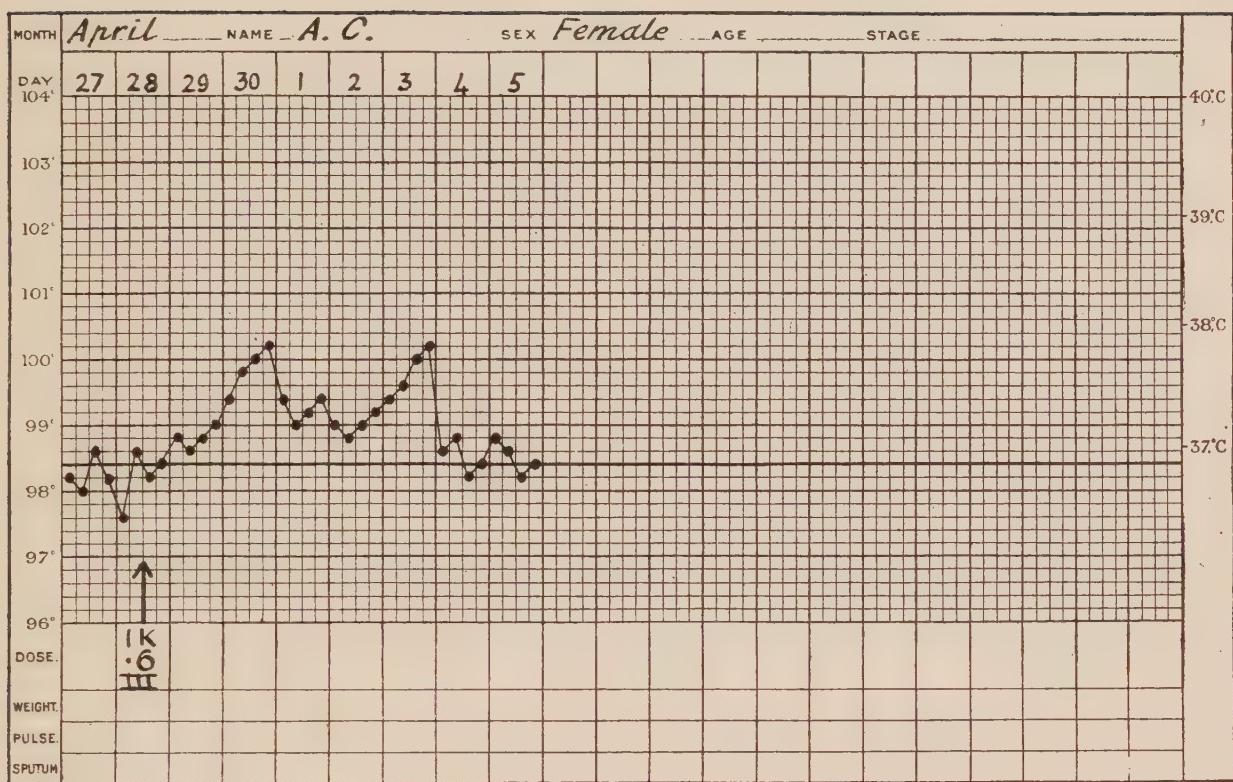


CHART VII.



CHART VIII.

I.K. Therapy in Pulmonary Tuberculosis

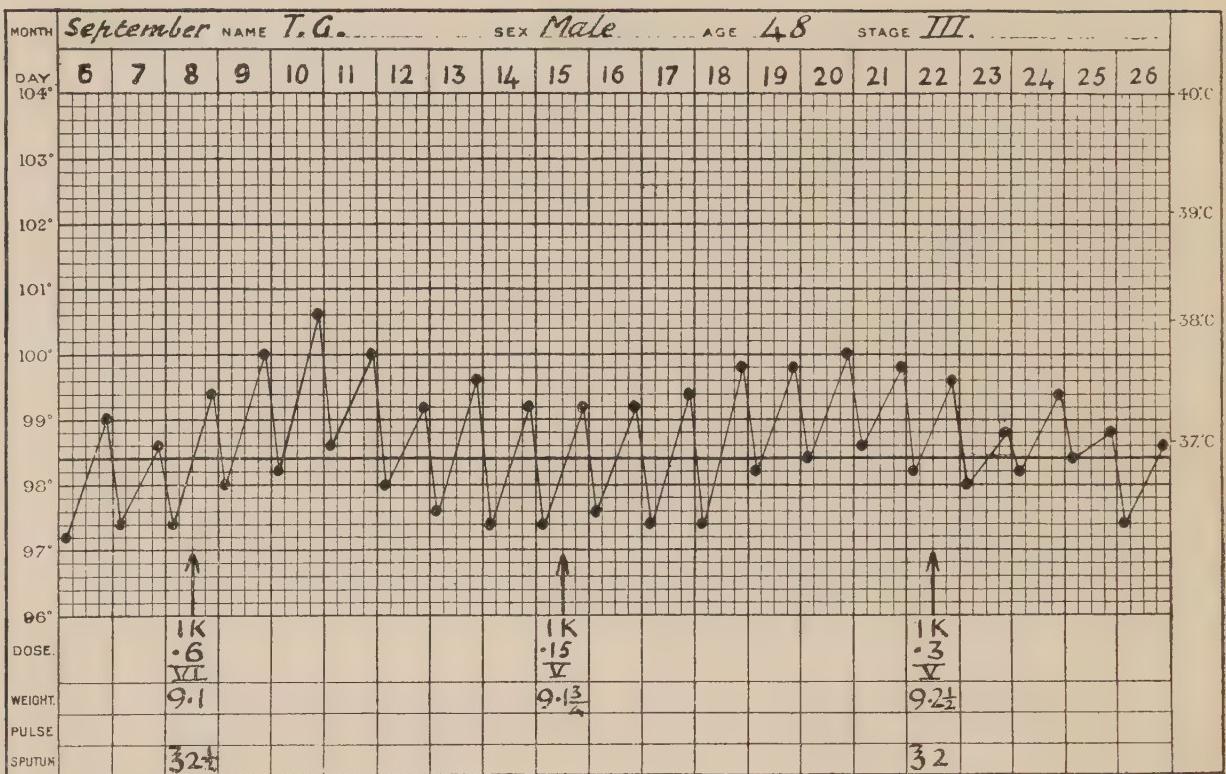


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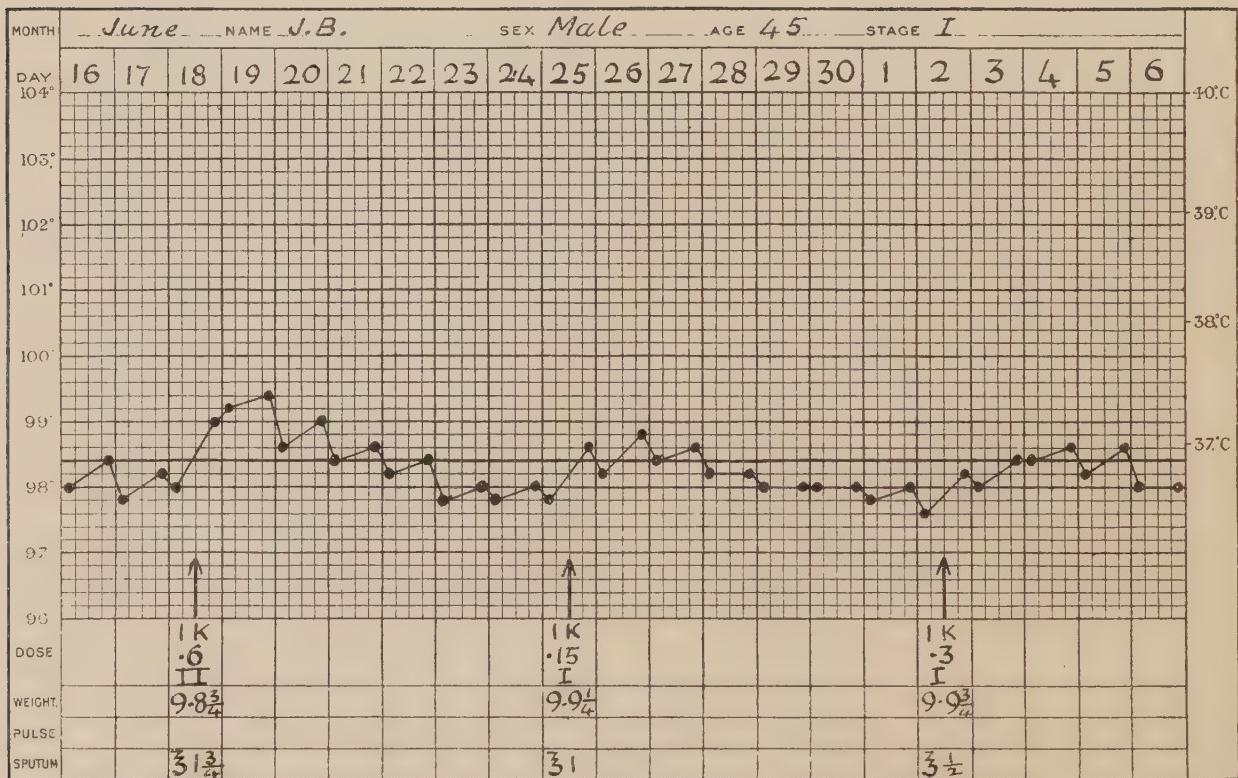


CHART X.

Charts

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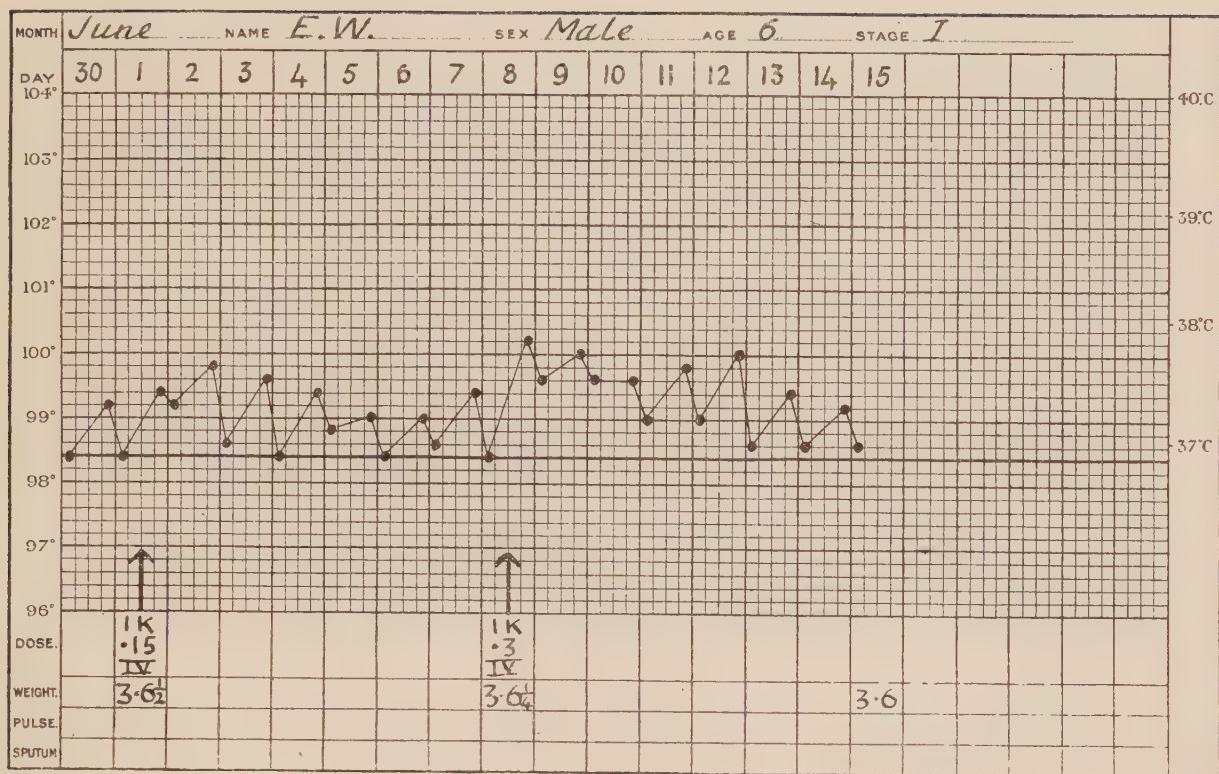


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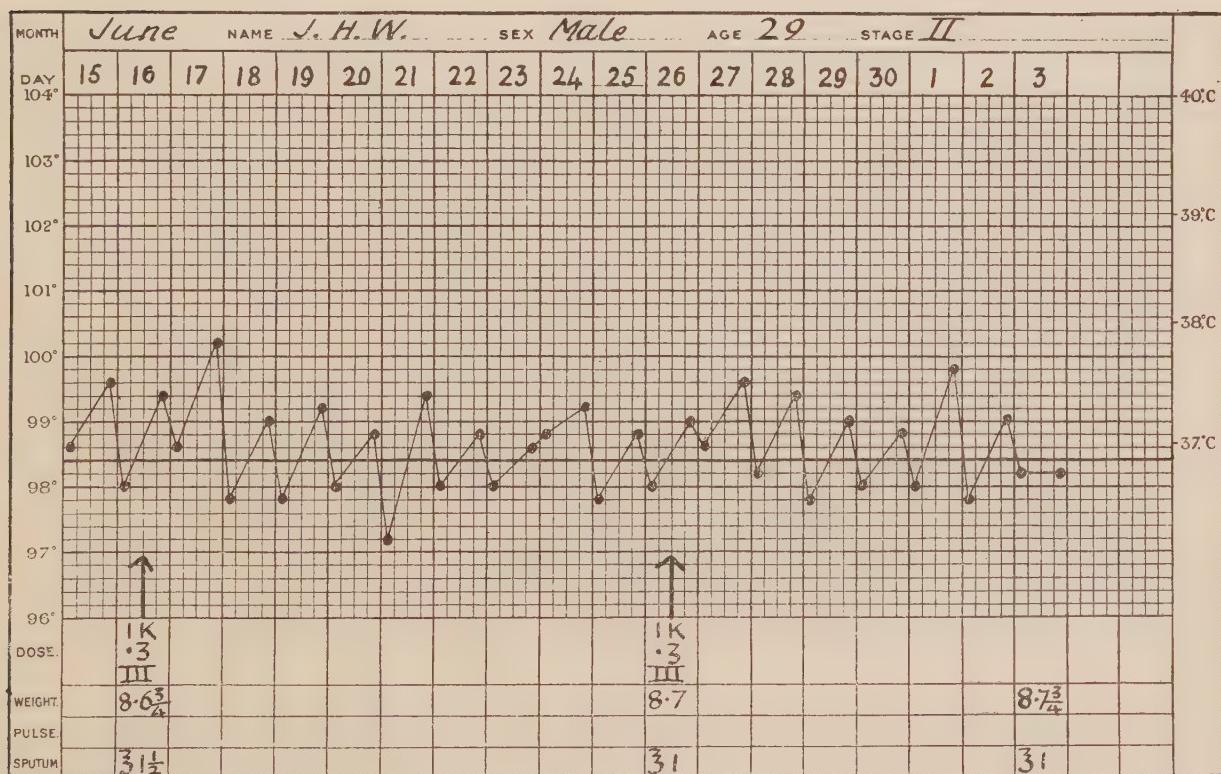


CHART XII.

I.K. Therapy in Pulmonary Tuberculosis

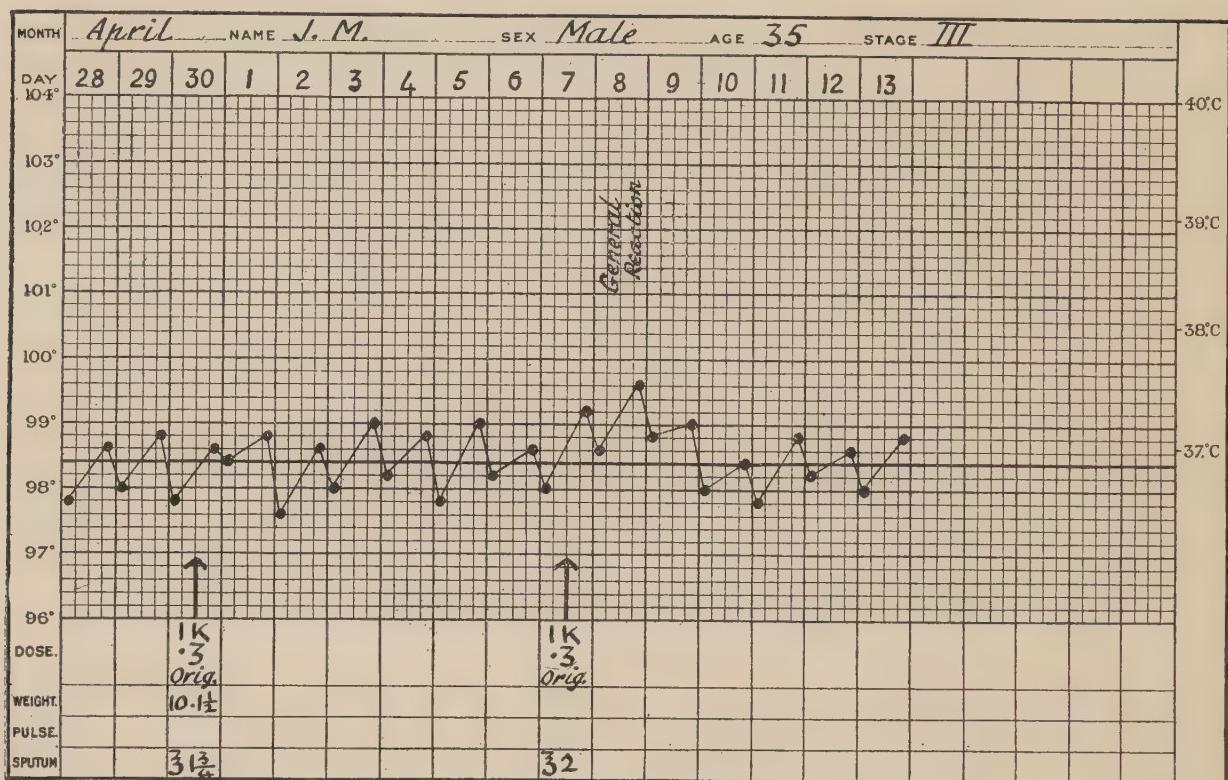


CHART XIII.

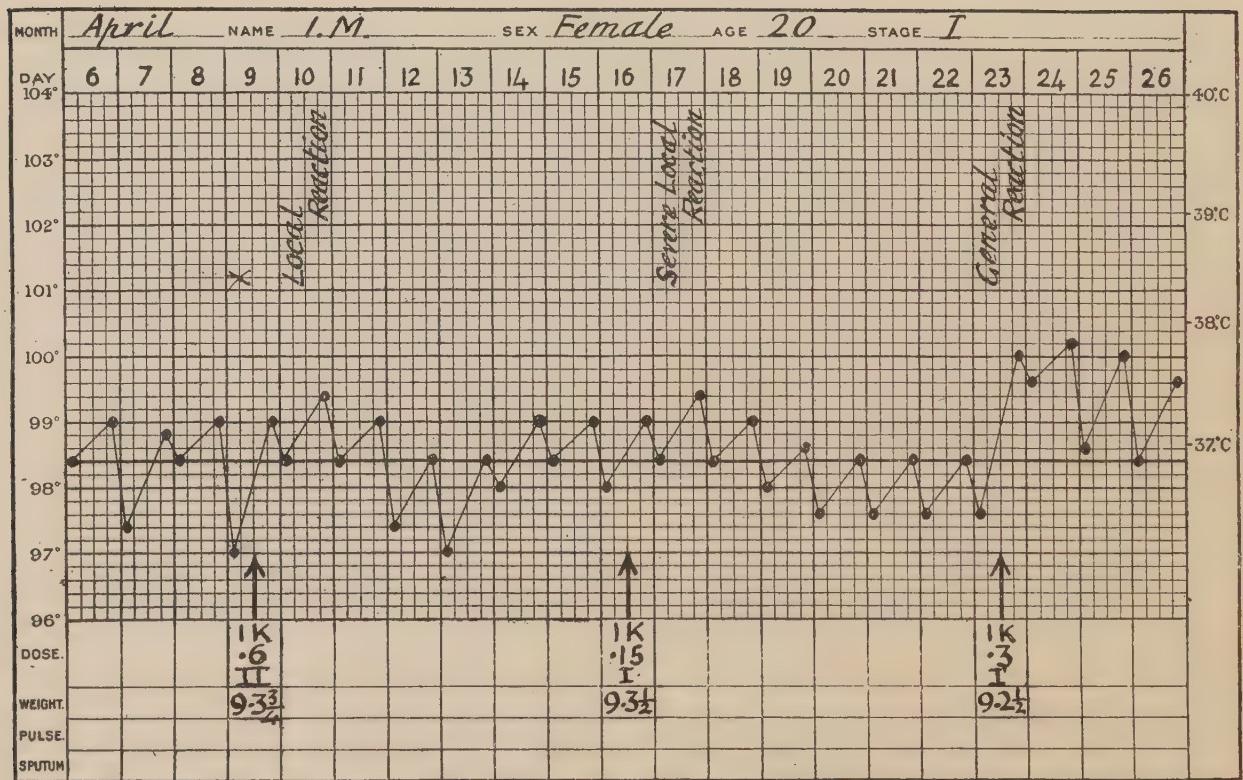


CHART XIV.

Charts

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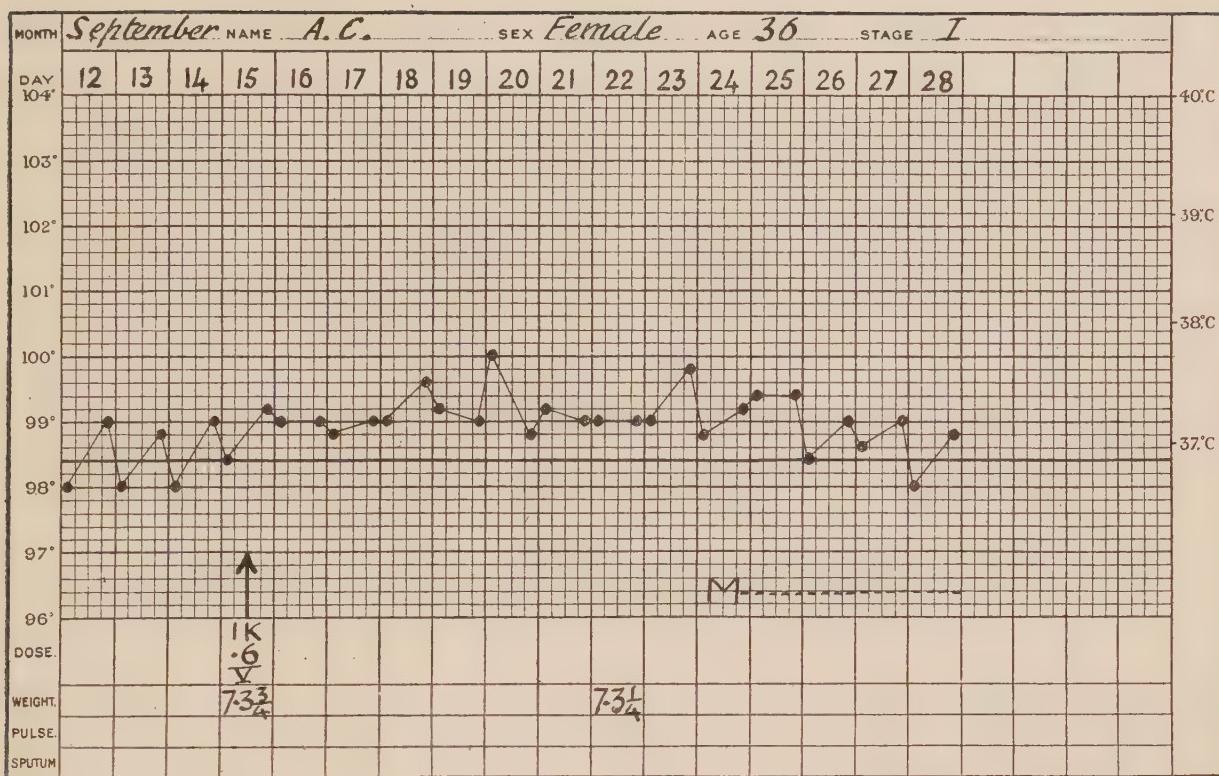


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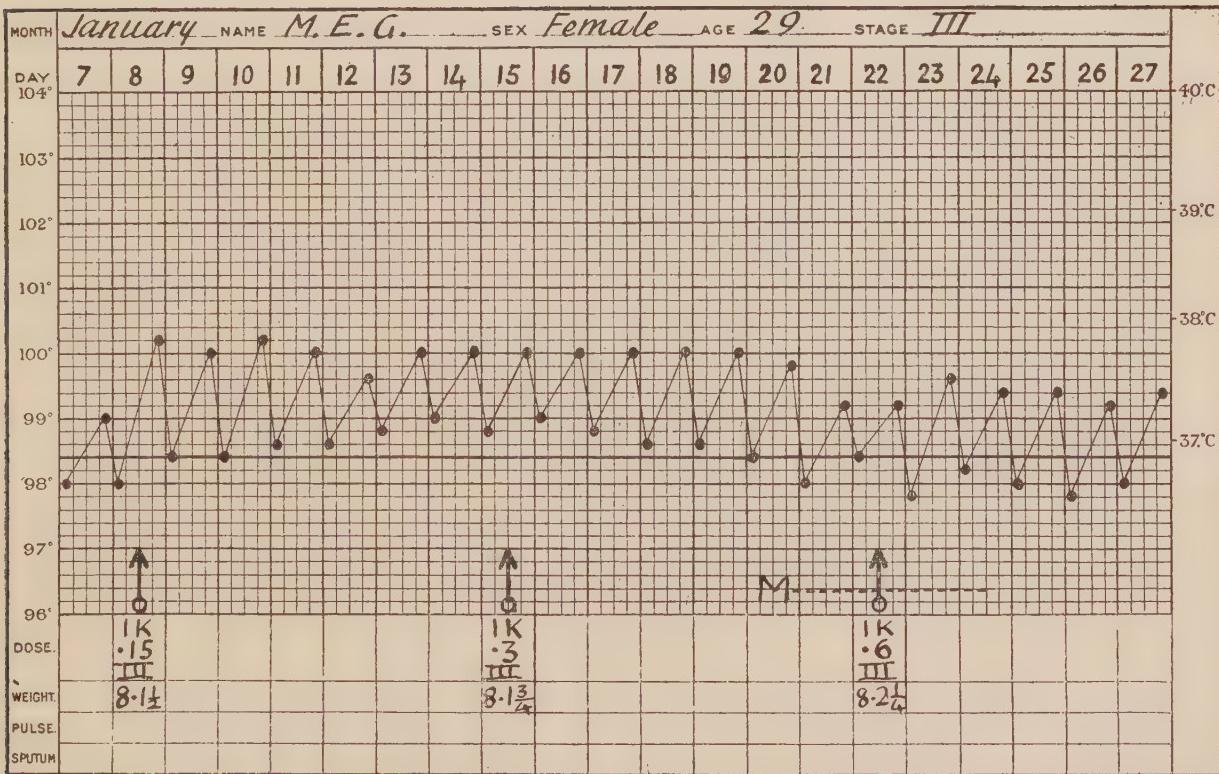


CHART XVI.

I.K. Therapy in Pulmonary Tuberculosis

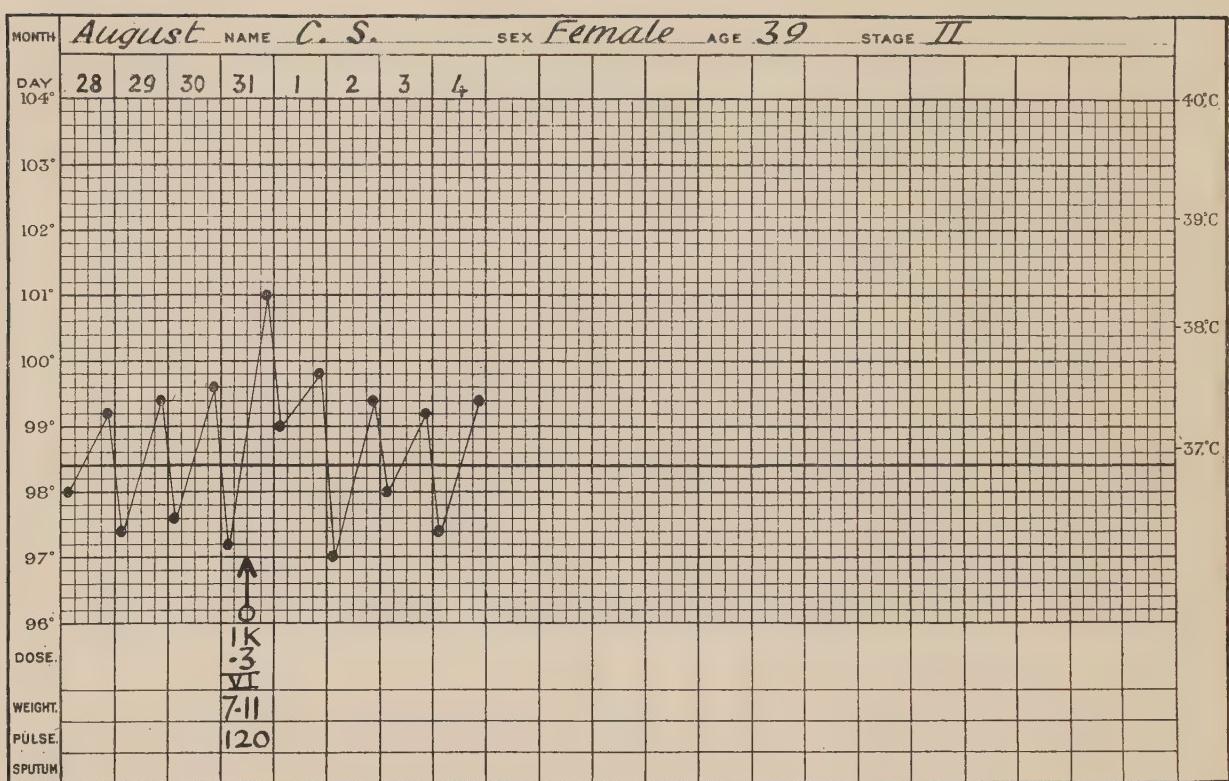


CHART XVII.

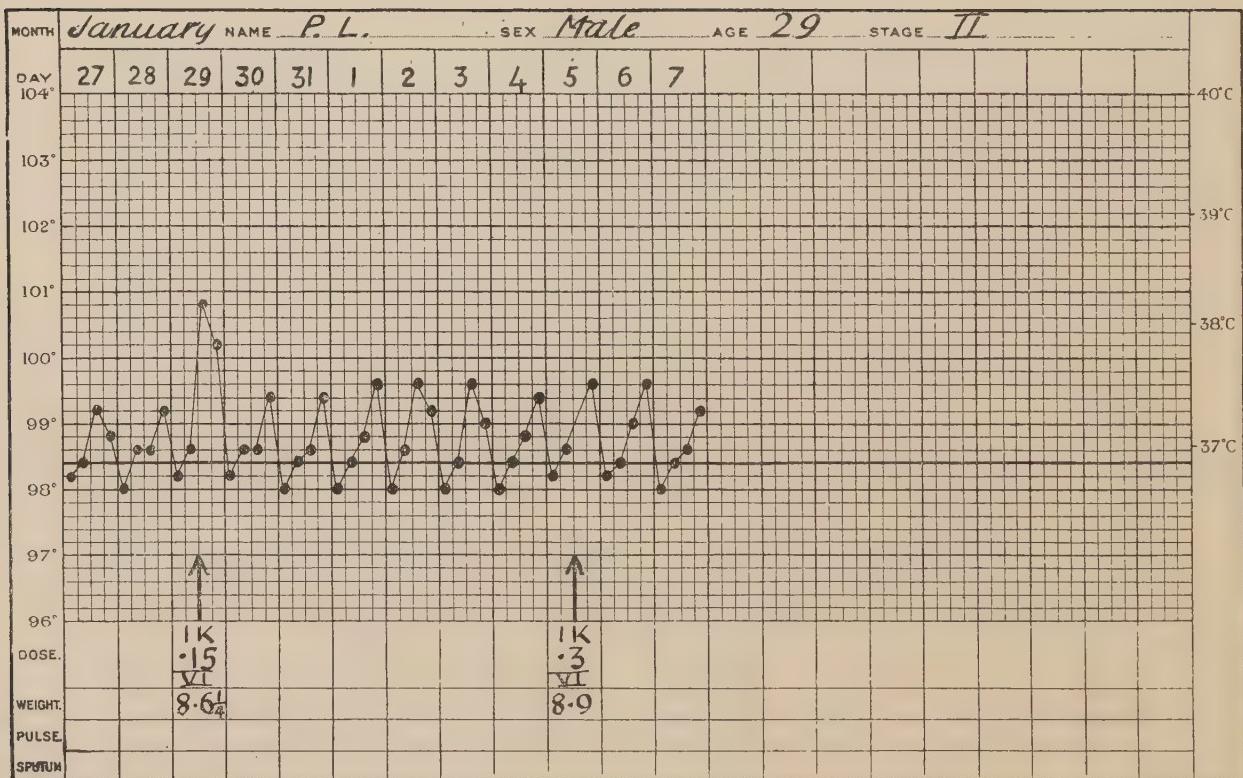


CHART XVIII

Charts

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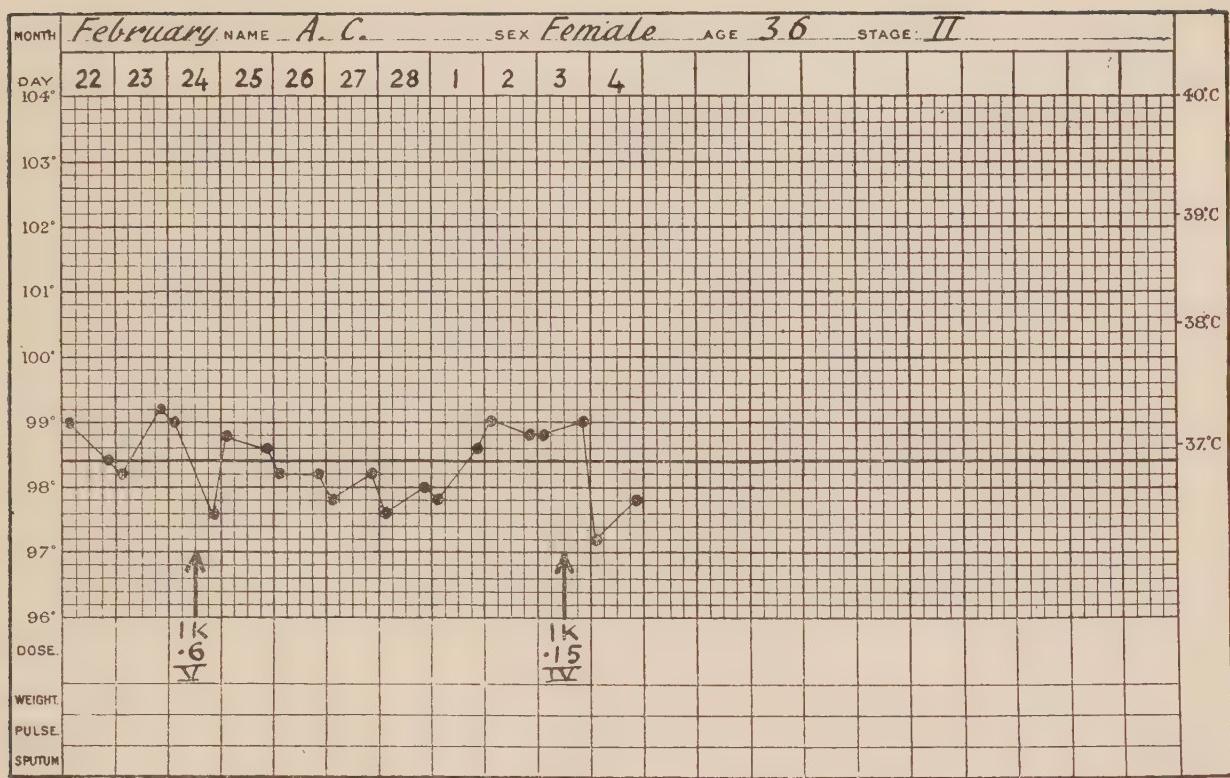


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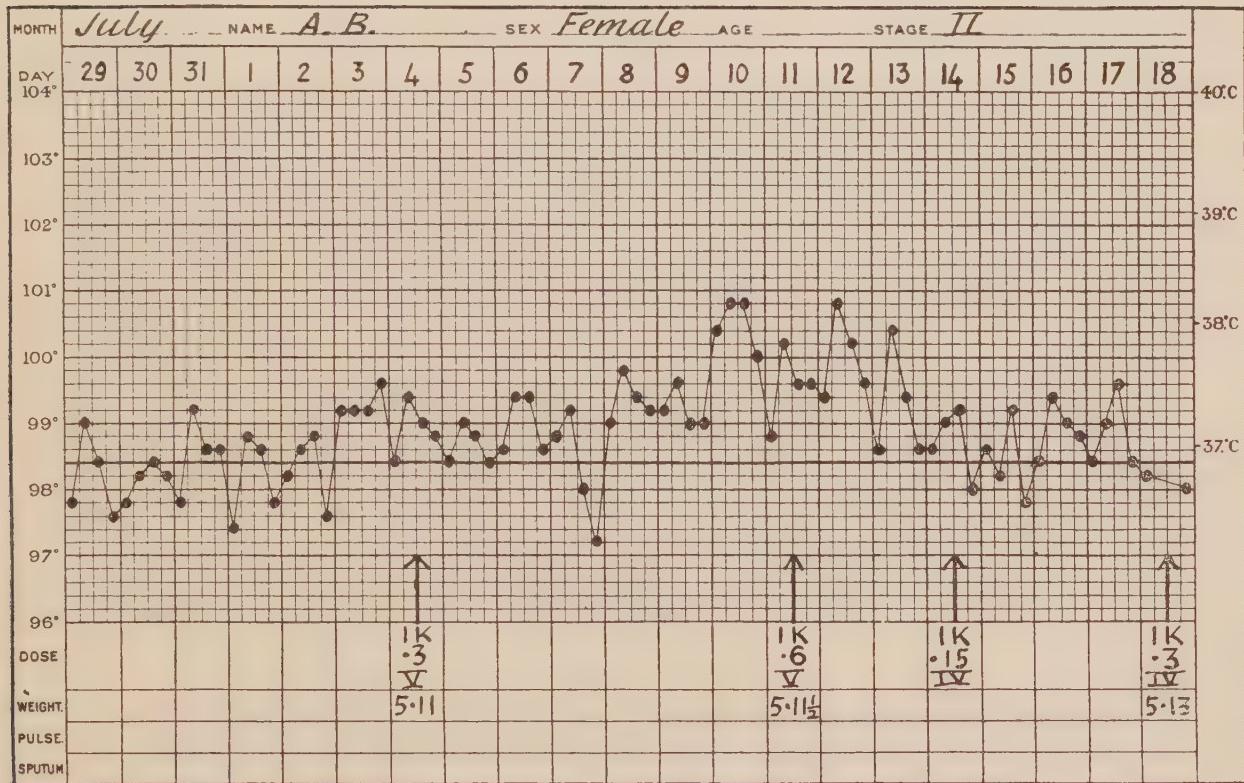


CHART XX.

I.K. Therapy in Pulmonary Tuberculosis

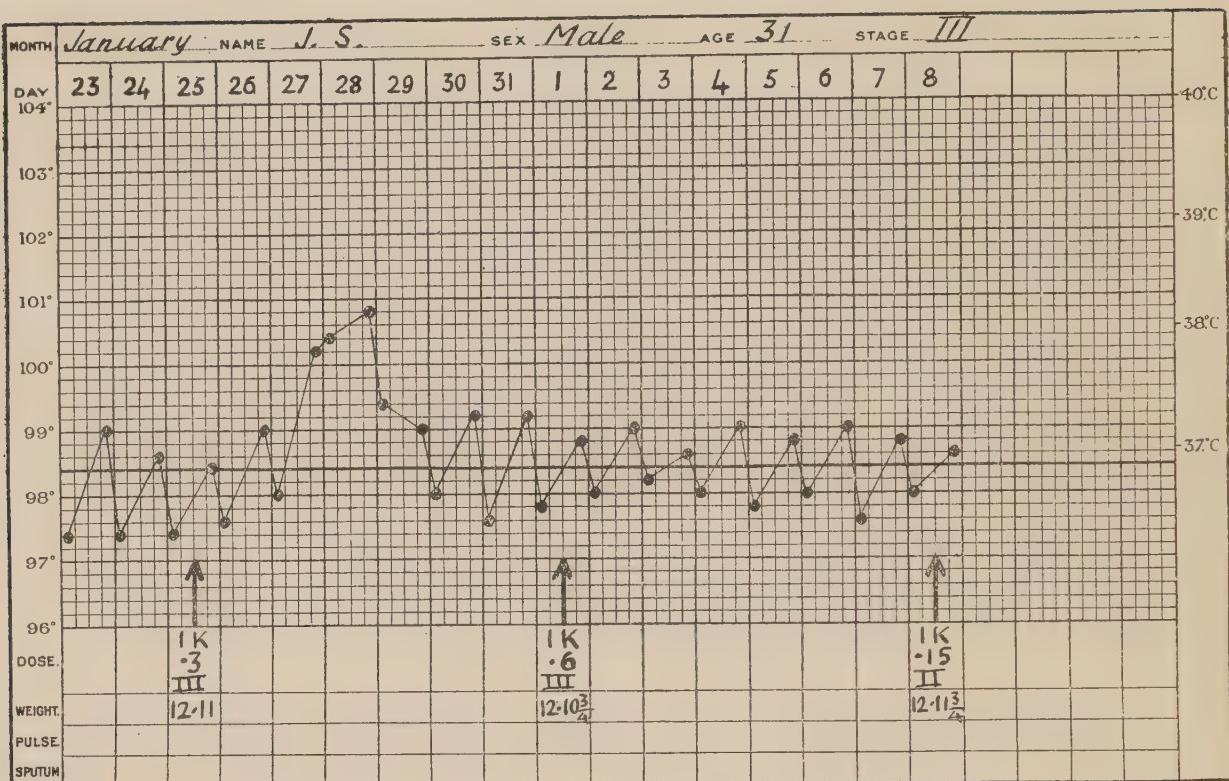


CHART XXI.

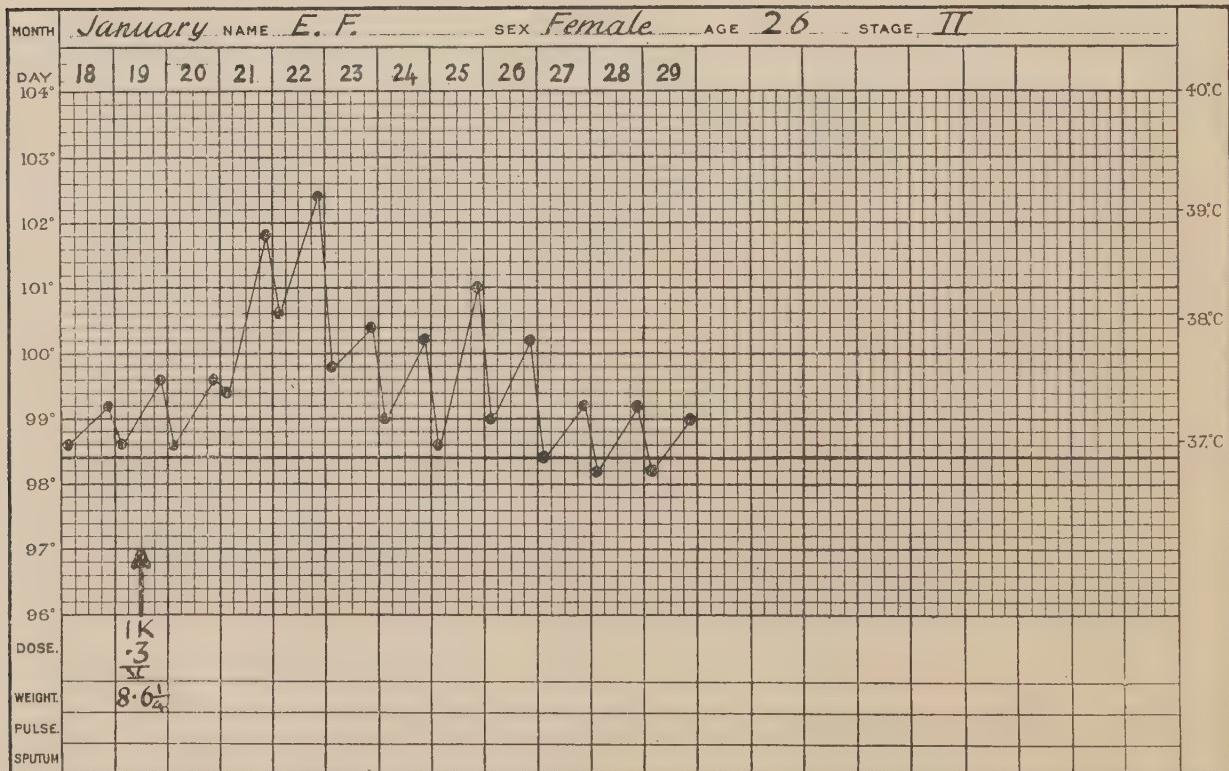


CHART XXII.

Charts

73

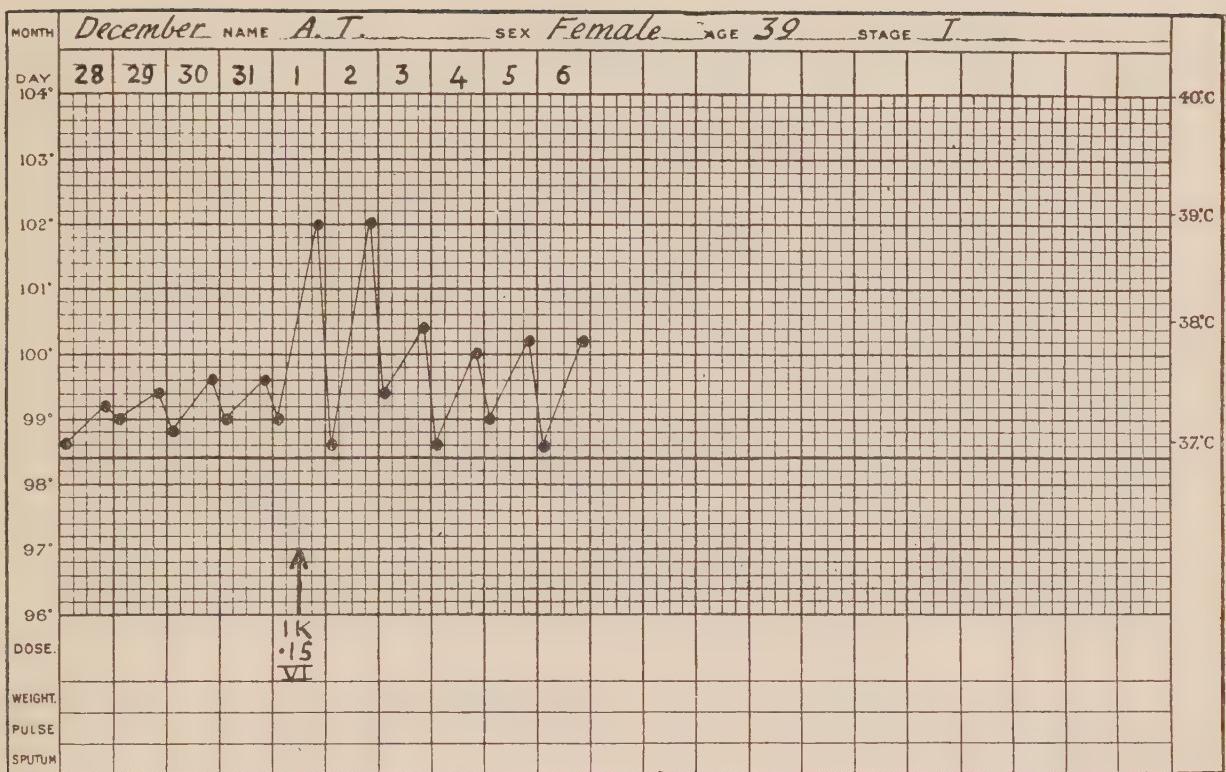


CHART XXIII.

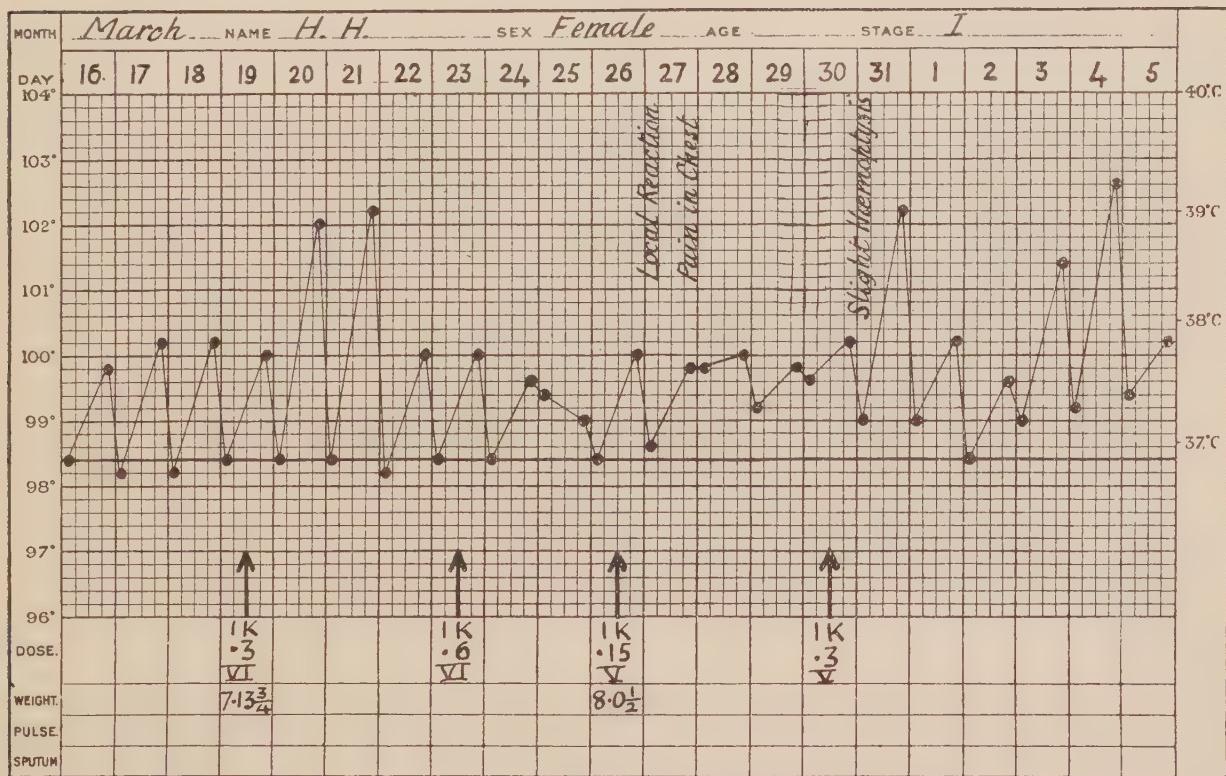


CHART XXIV.

I.K. Therapy in Pulmonary Tuberculosis

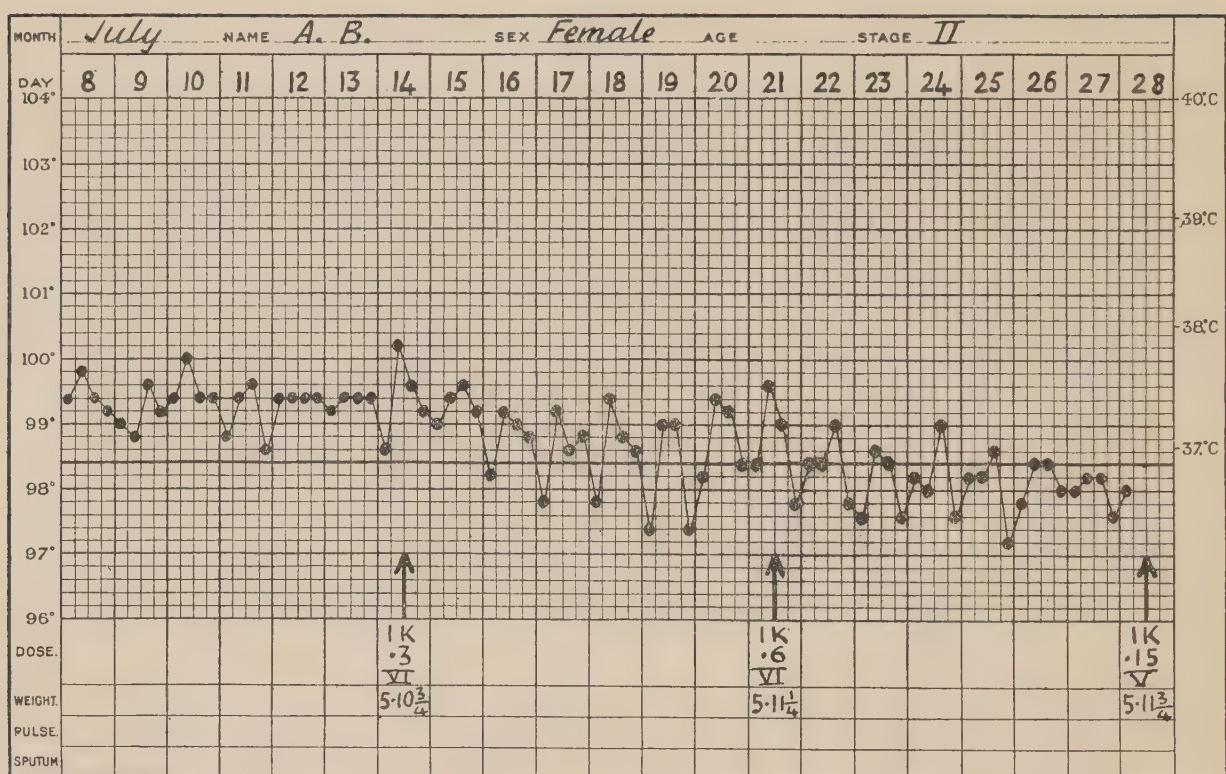


CHART XXV.

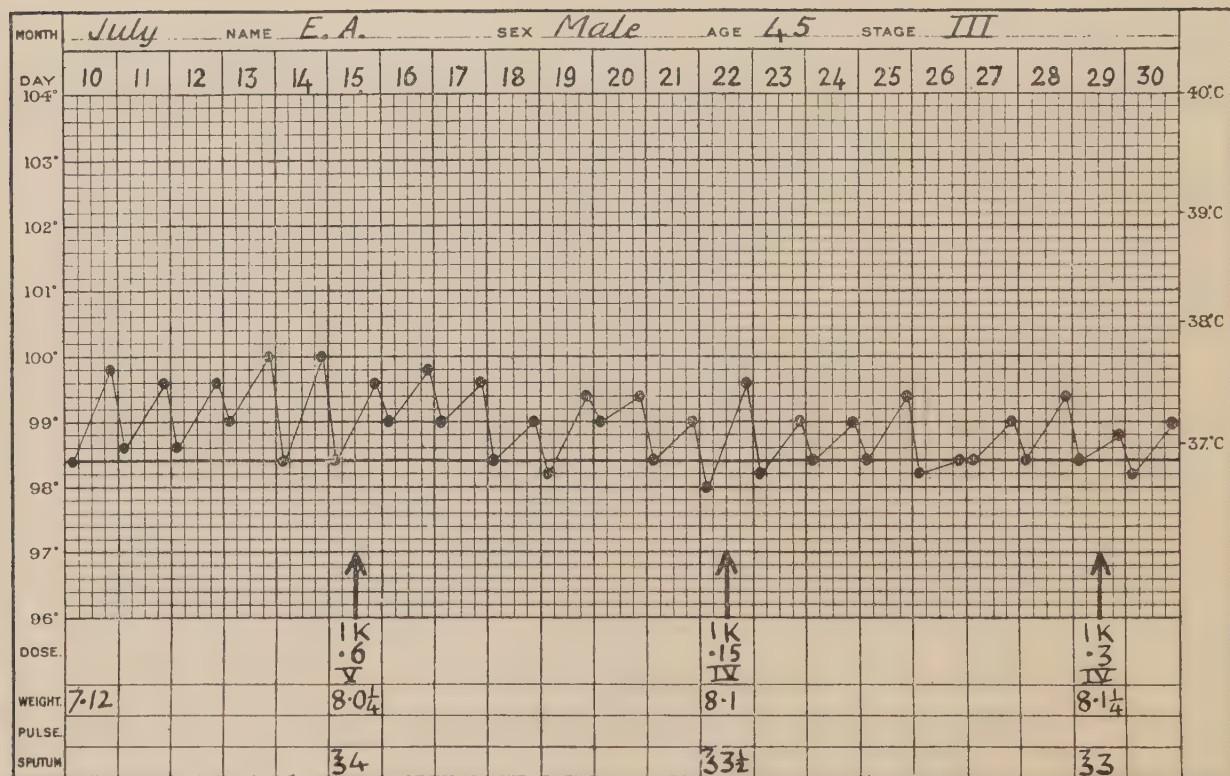


CHART XXVI.

Charts

75

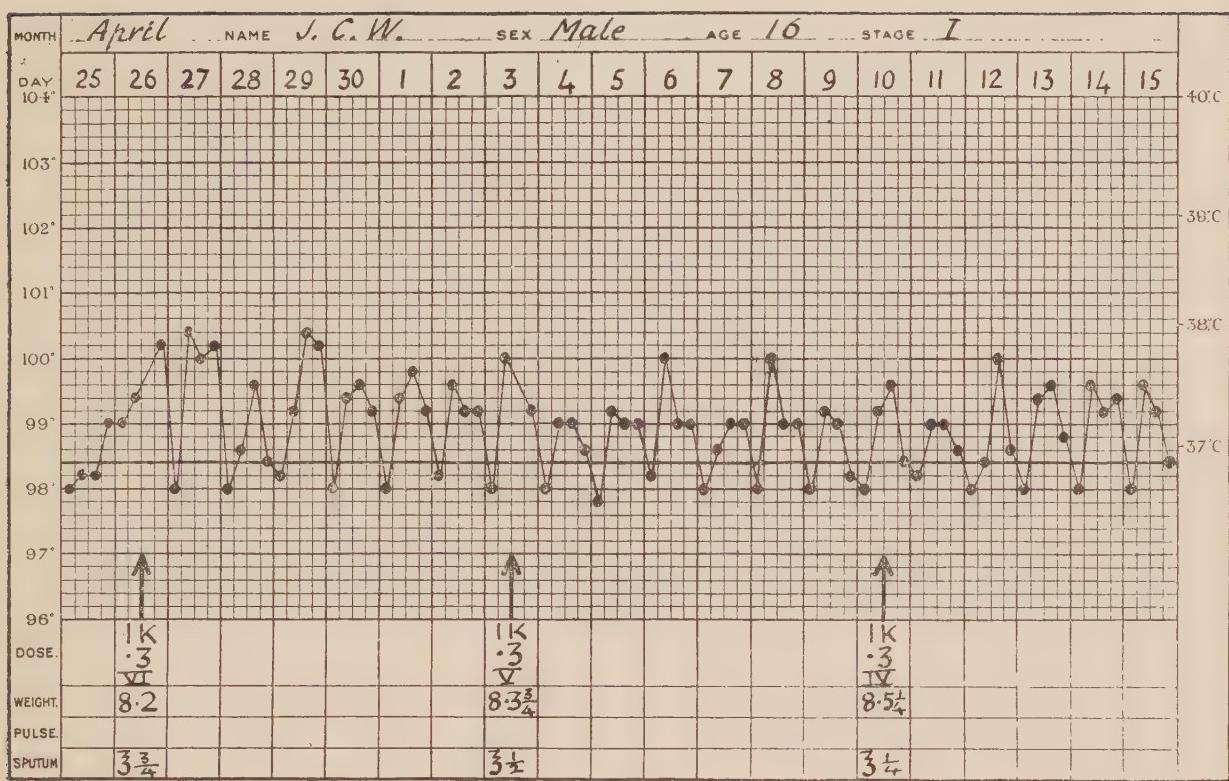


CHART XXVII.

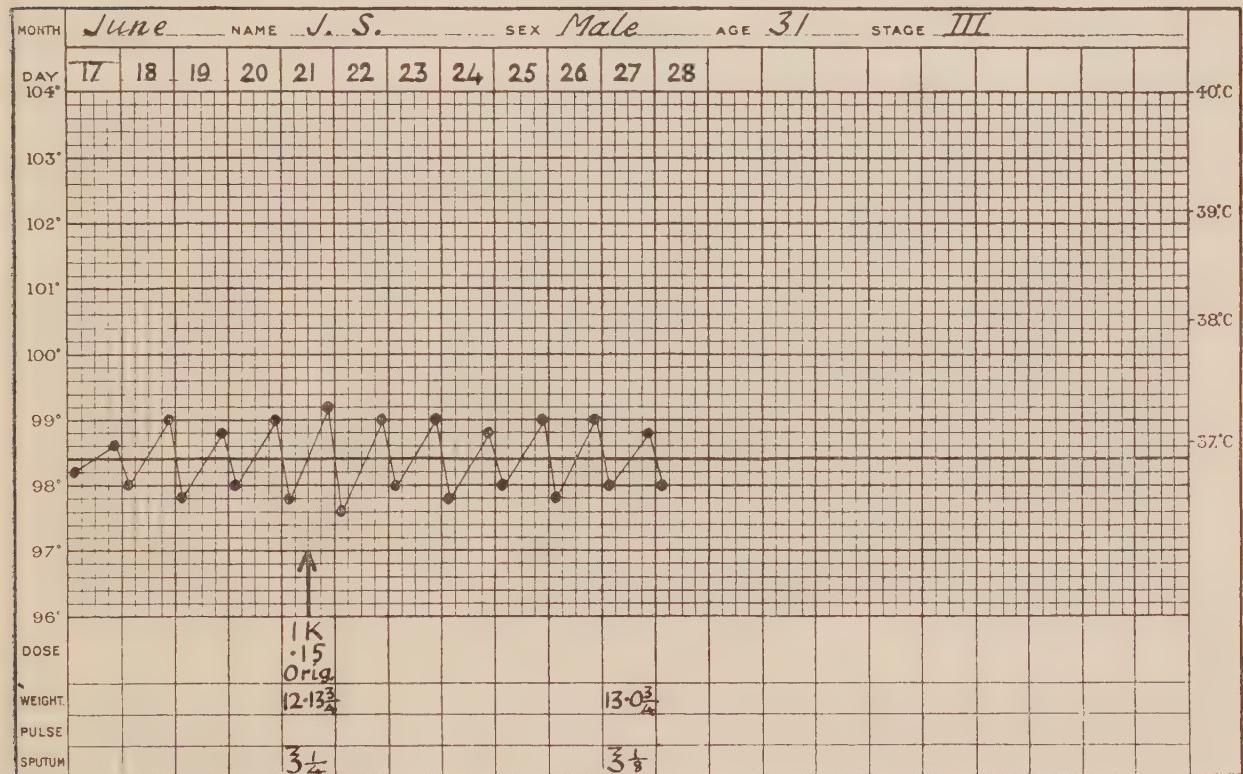


CHART XXVIII.

I.K. Therapy in Pulmonary Tuberculosis

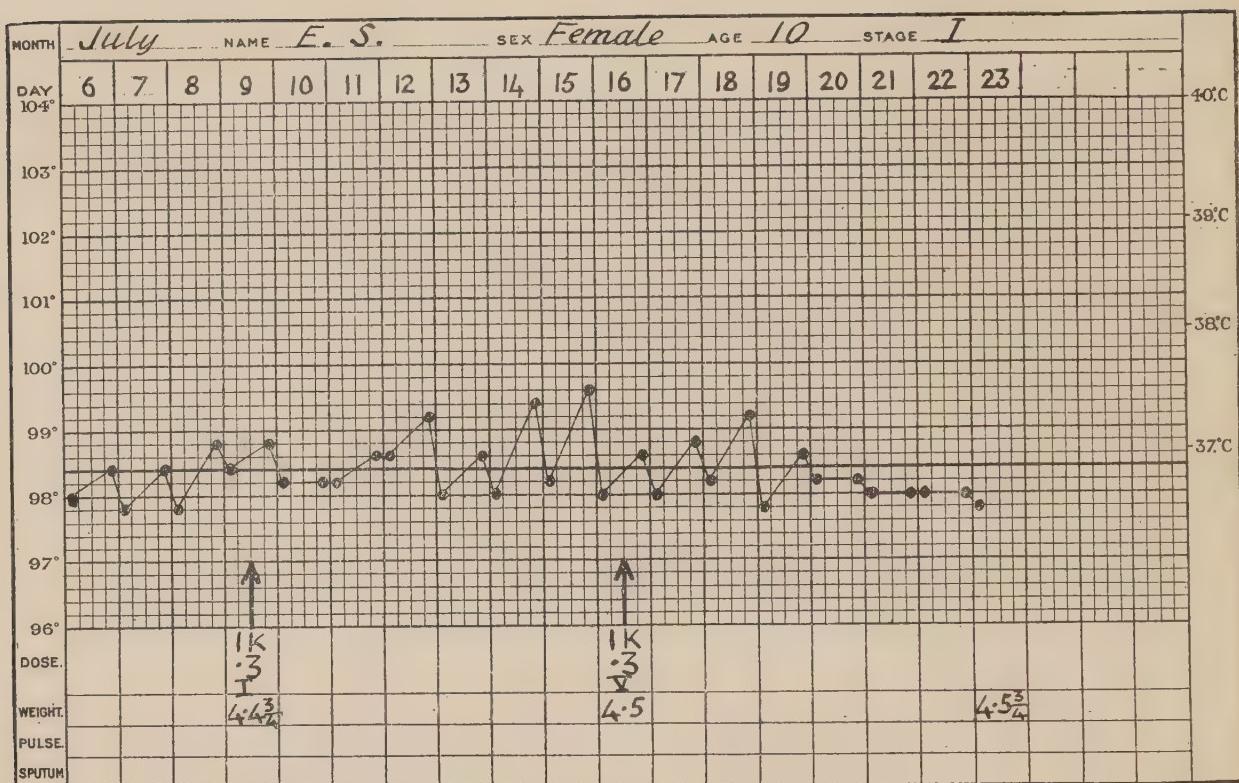


CHART XXIX.

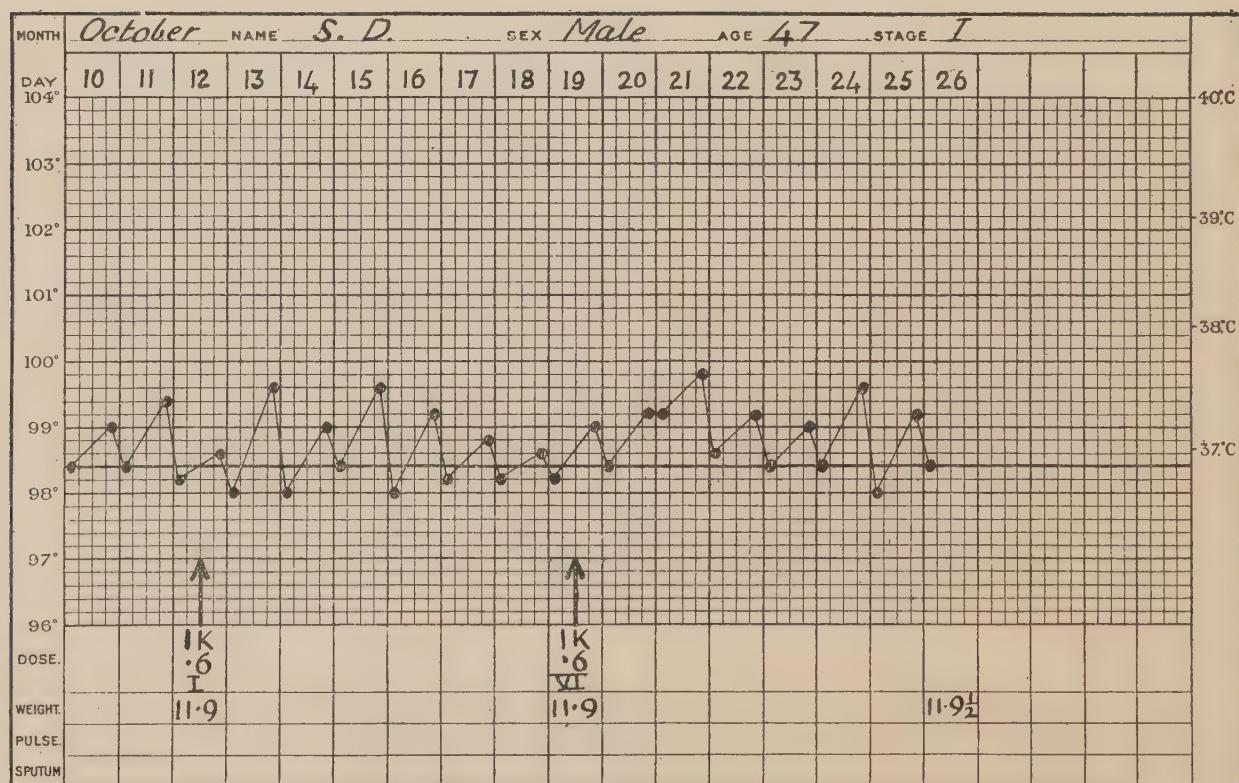


CHART XXX.

Charts

77

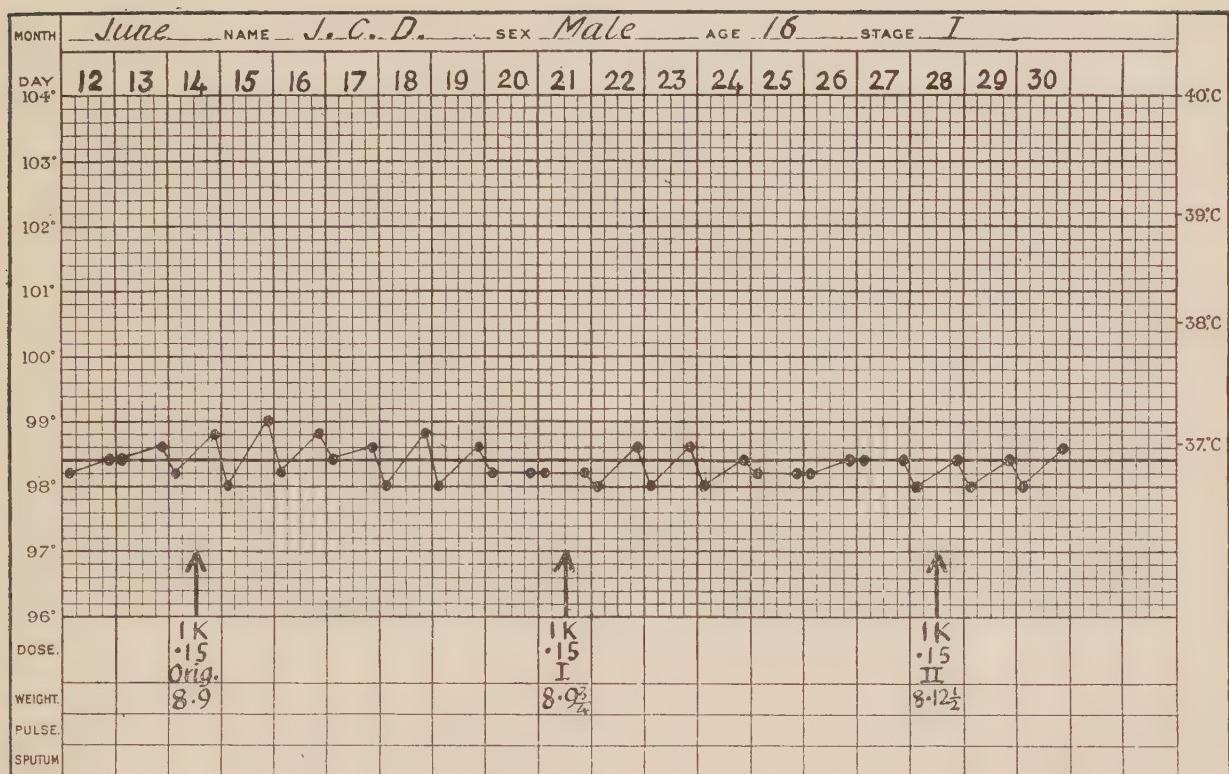


CHART XXXI.

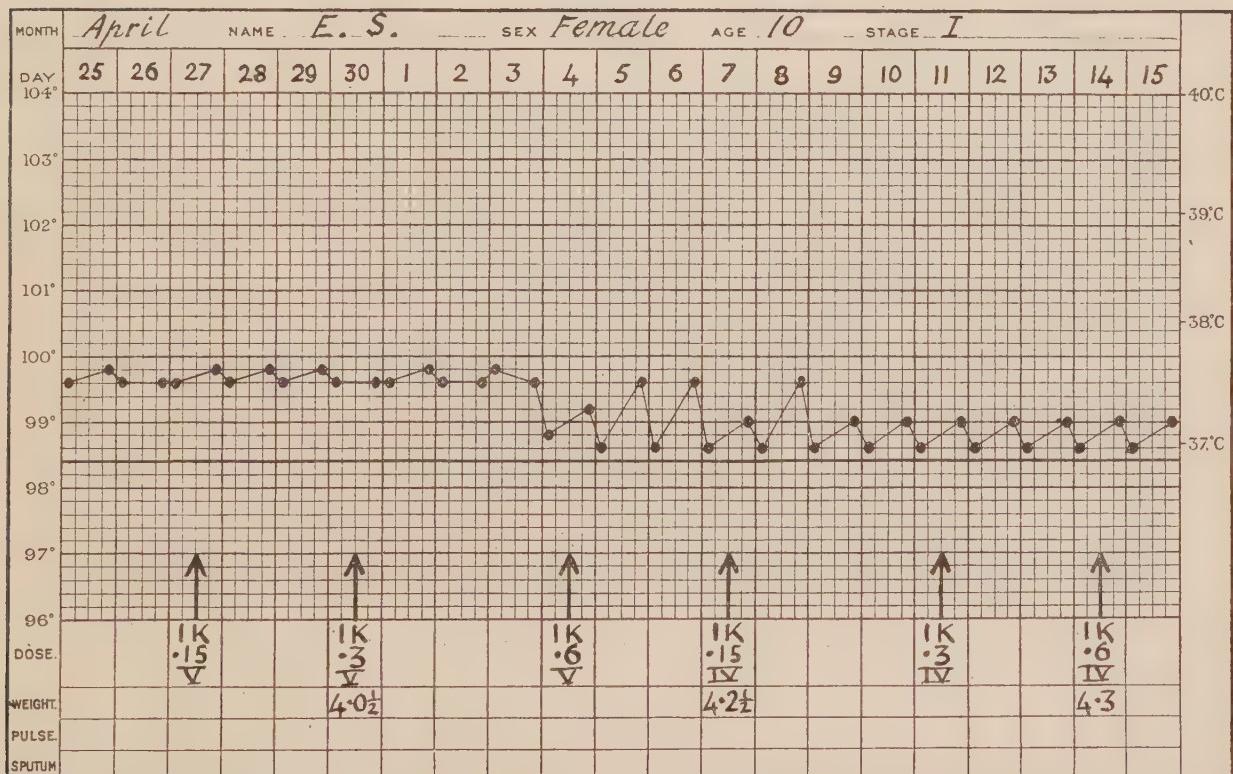


CHART XXXII.

I.K. Therapy in Pulmonary Tuberculosis

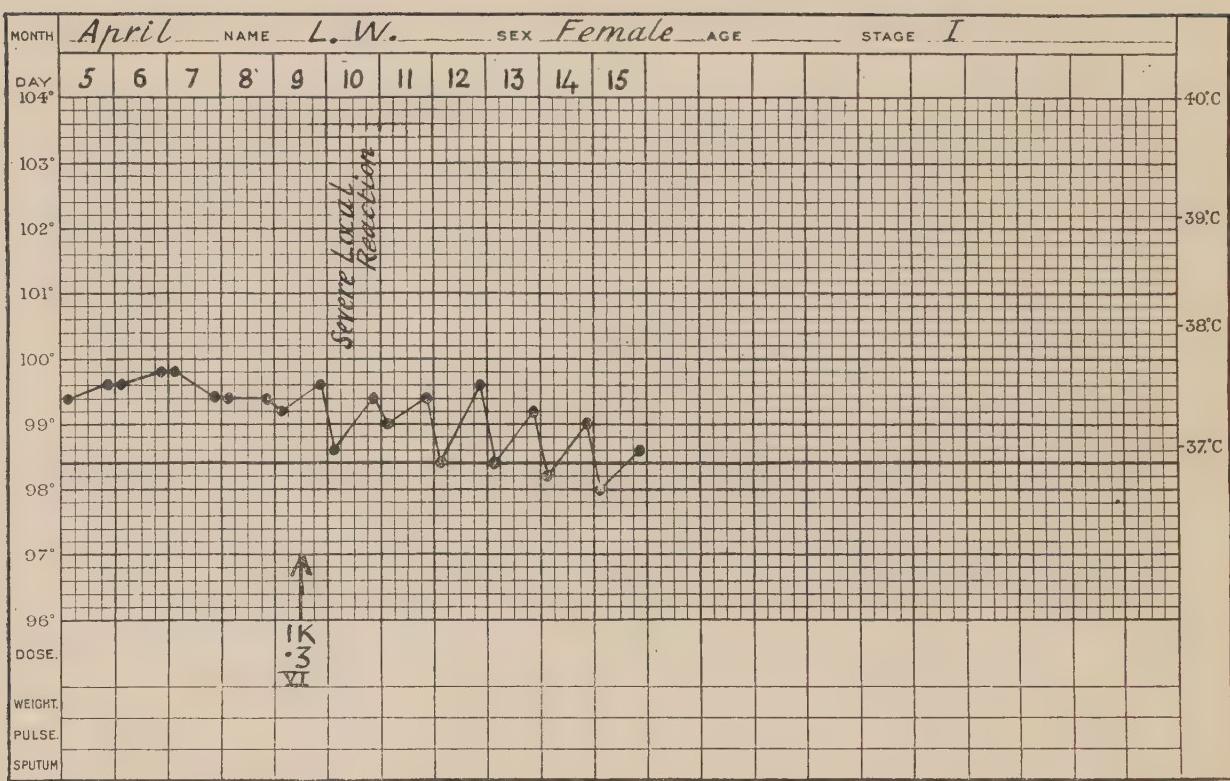


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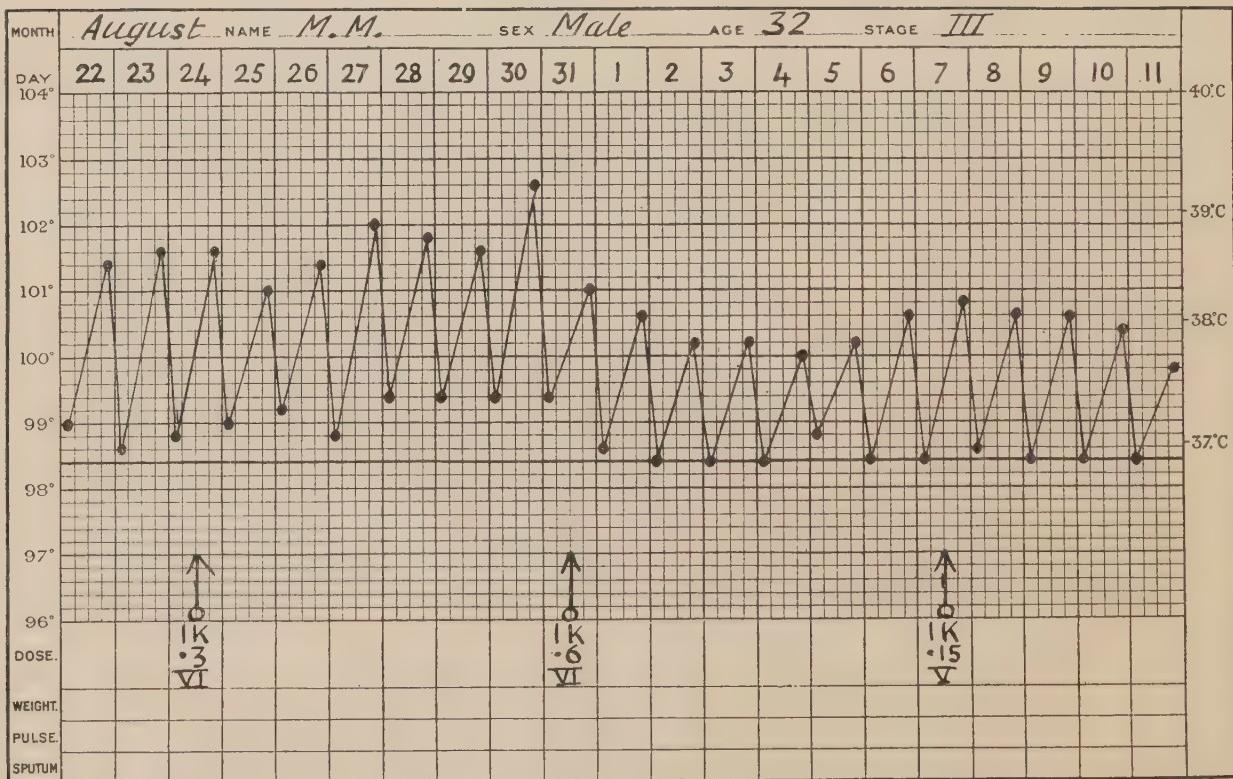


CHART XXXIV.

Charts

79

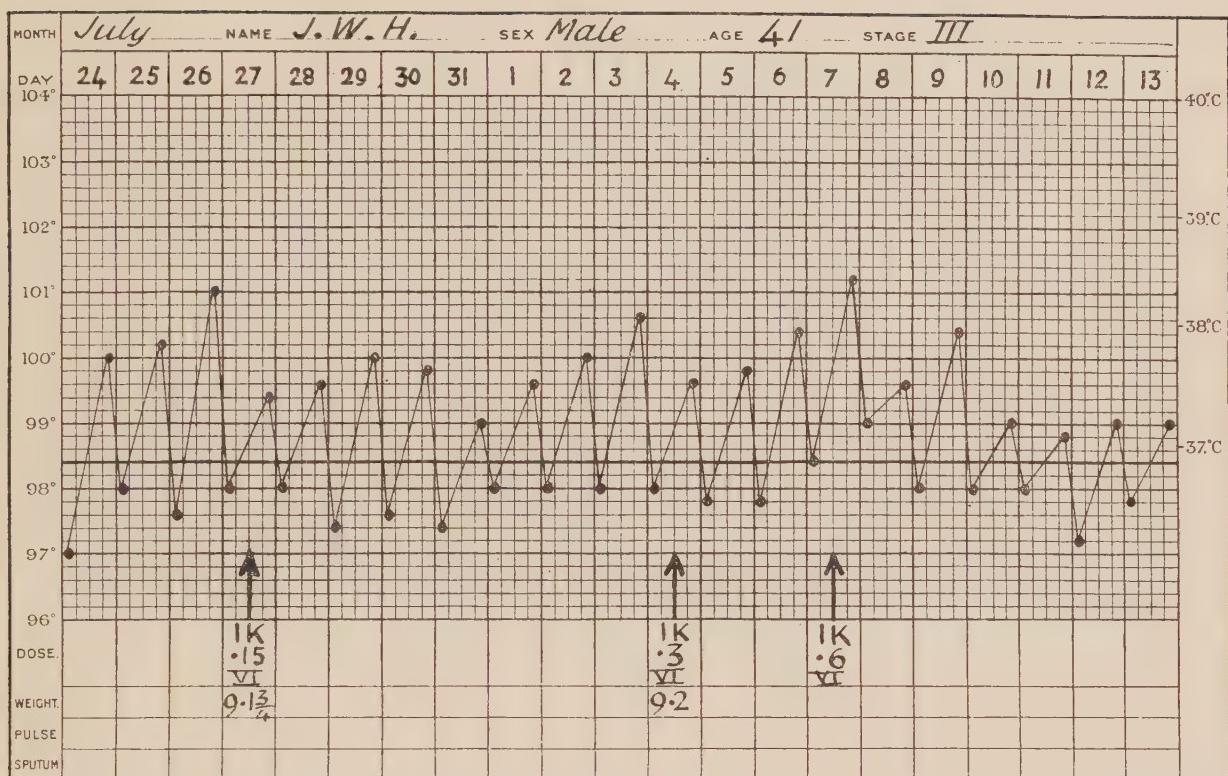


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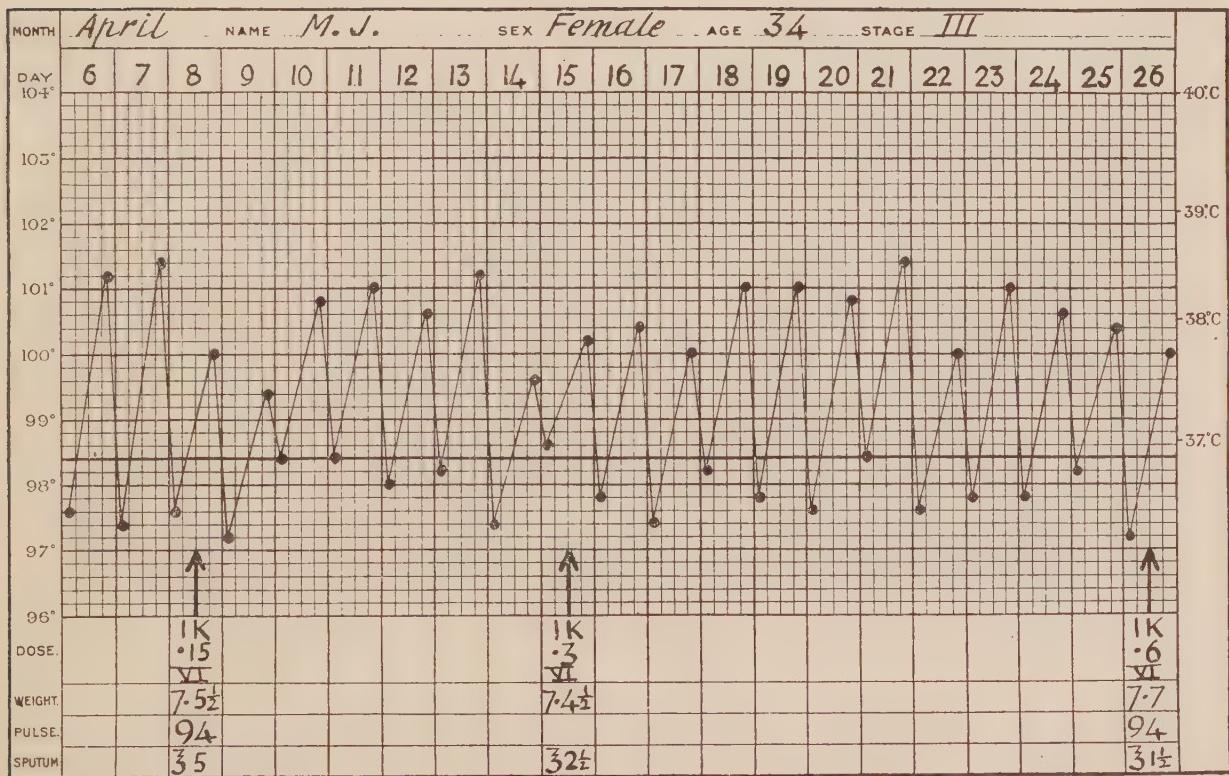


CHART XXXVI.

I.K. Therapy in Pulmonary Tuberculosis

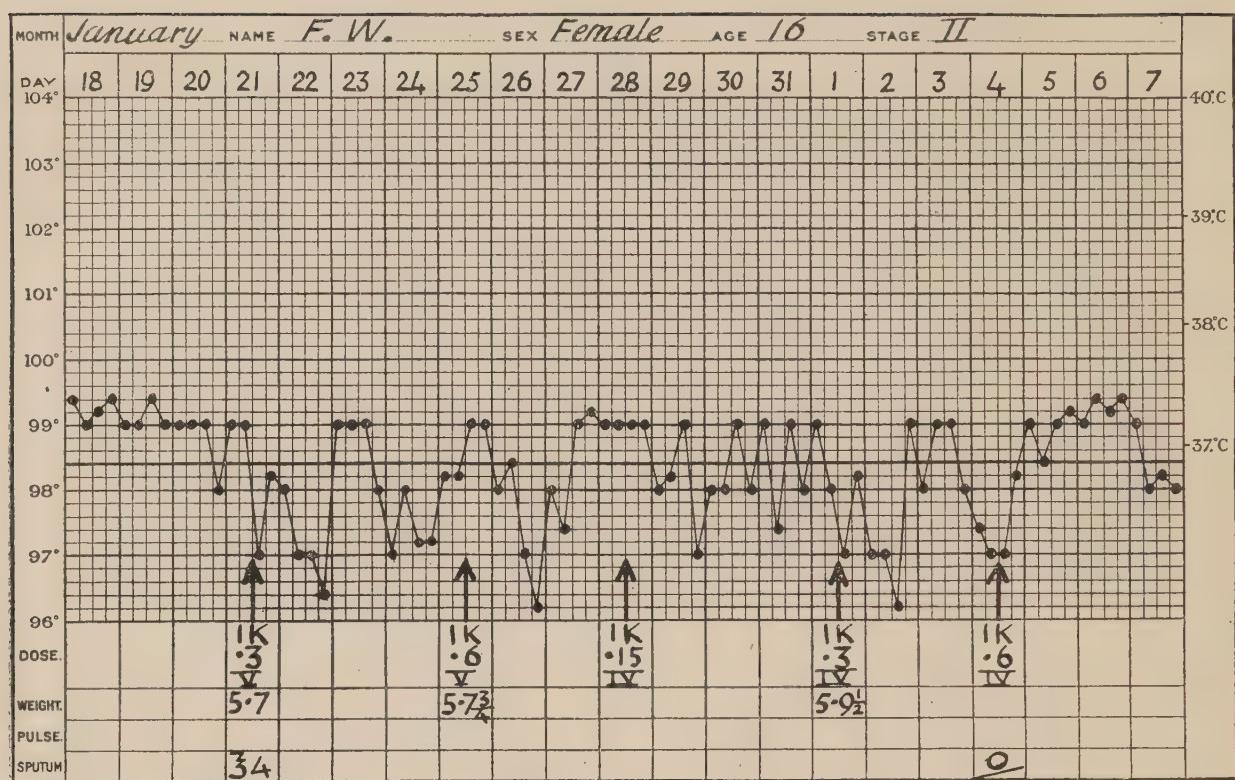


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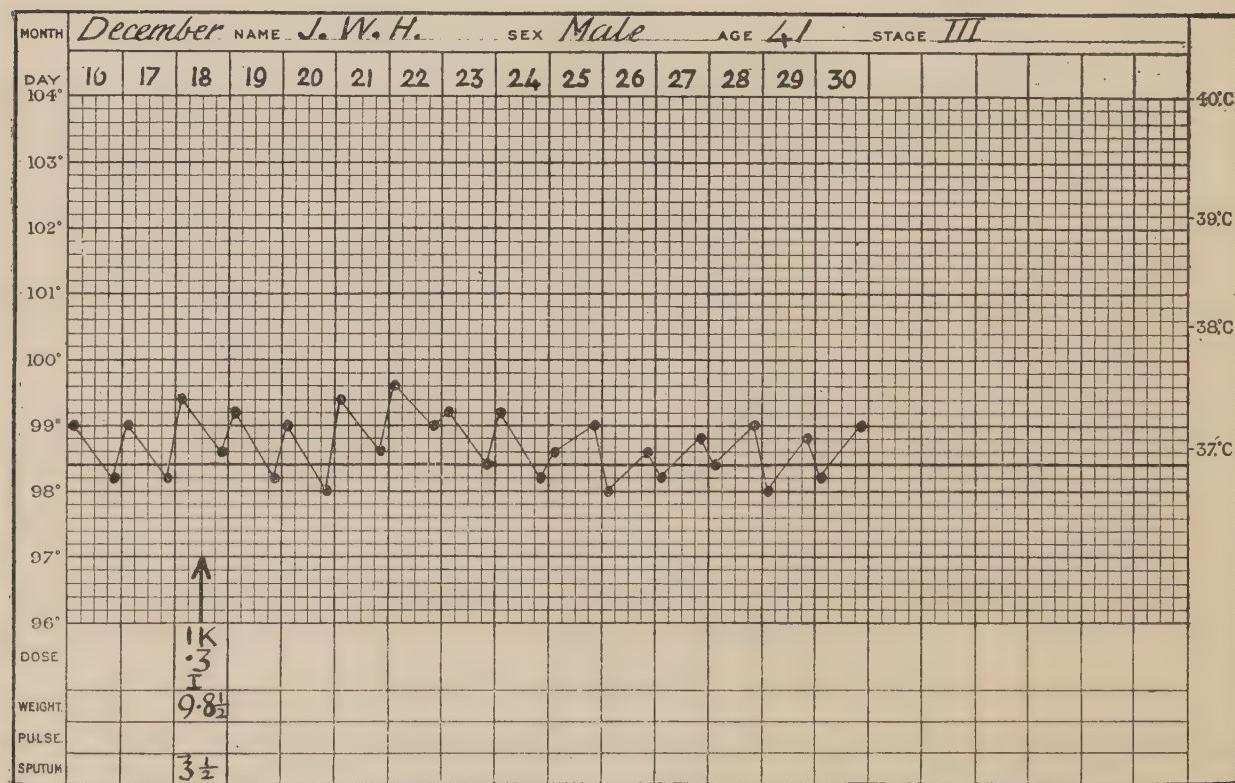


CHART XXXVIII.

Charts

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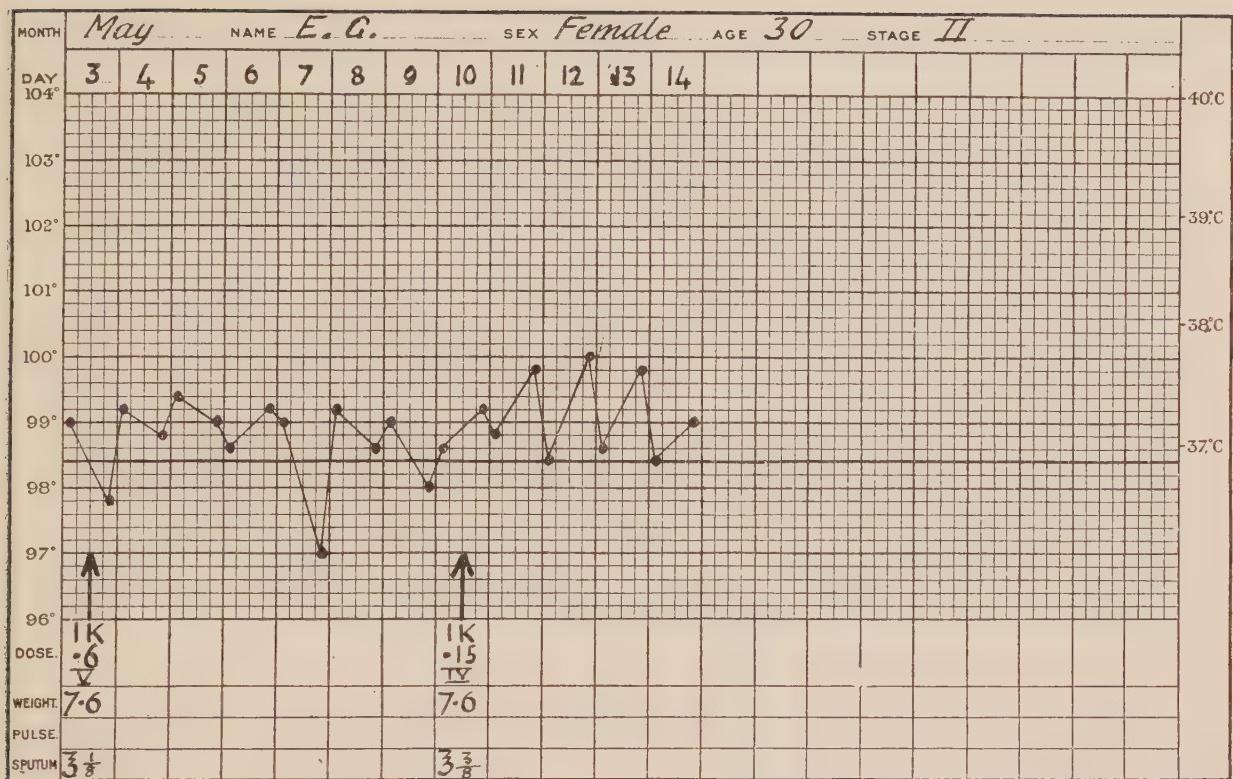


CHART XXXIX.

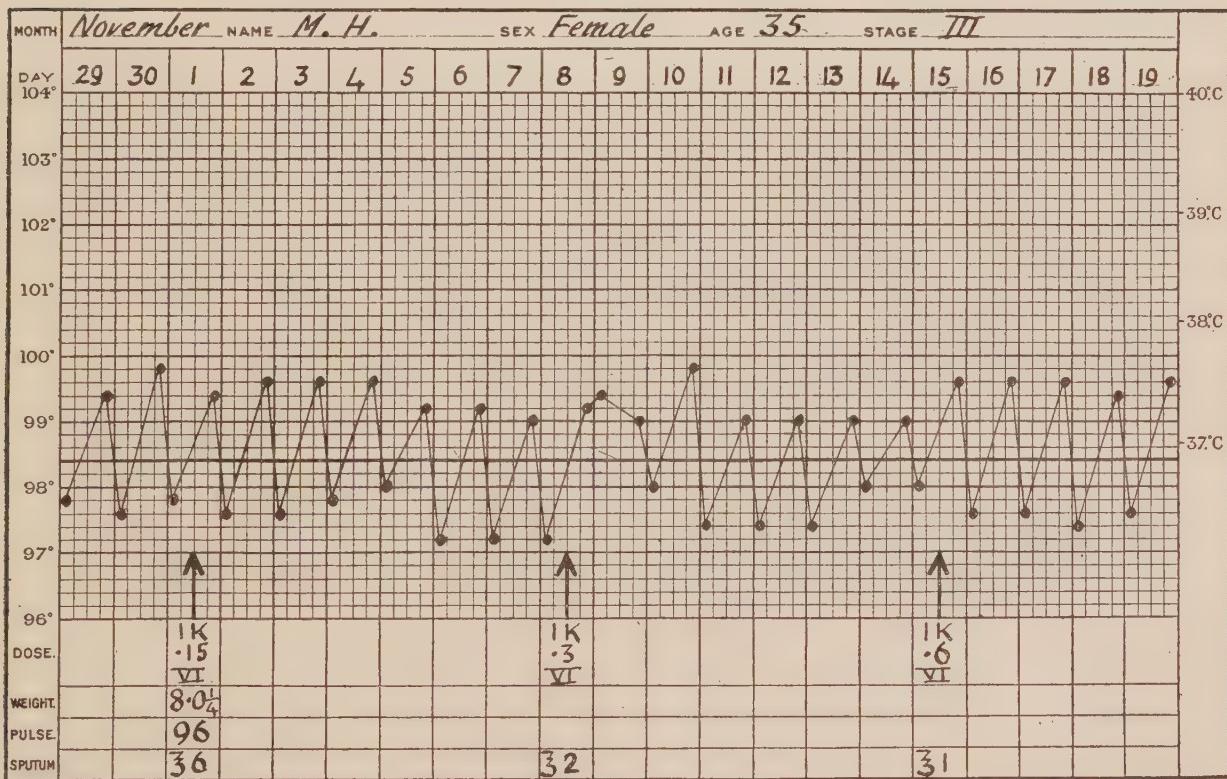


CHART XL.

I.K. Therapy in Pulmonary Tuberculosis

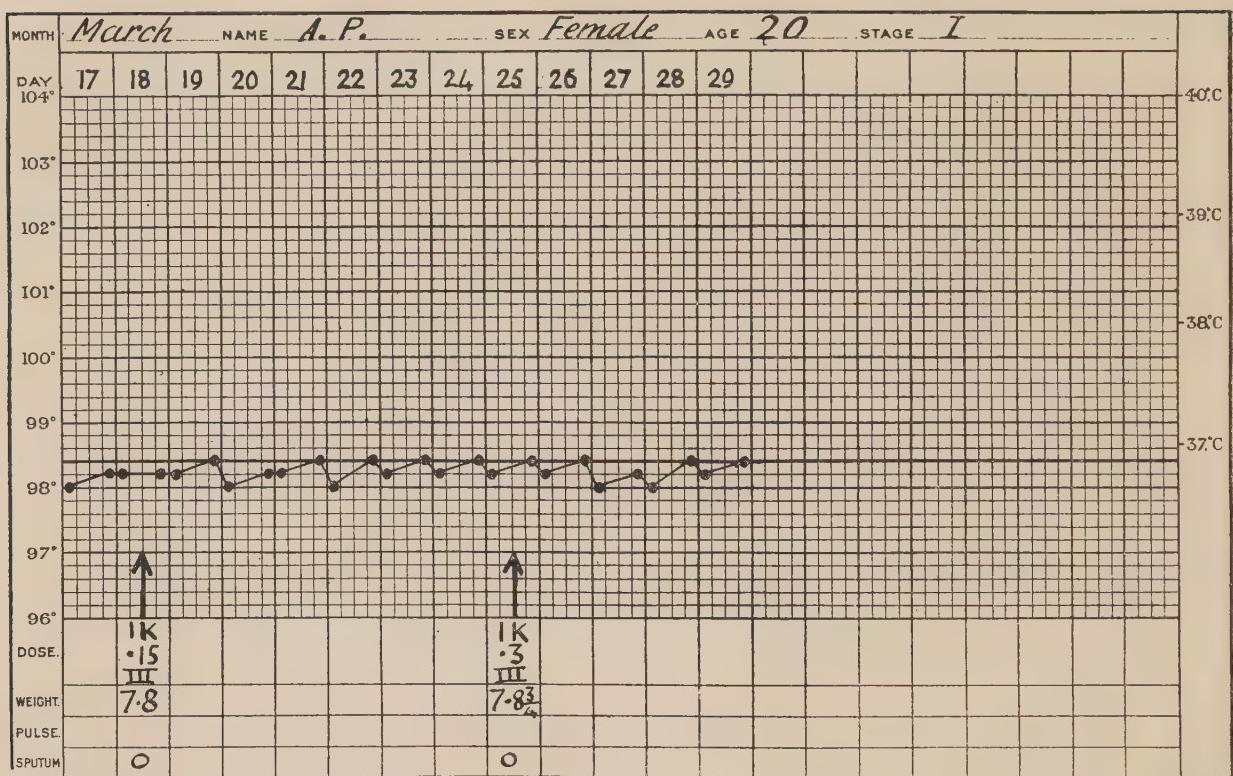


CHART XL.I.

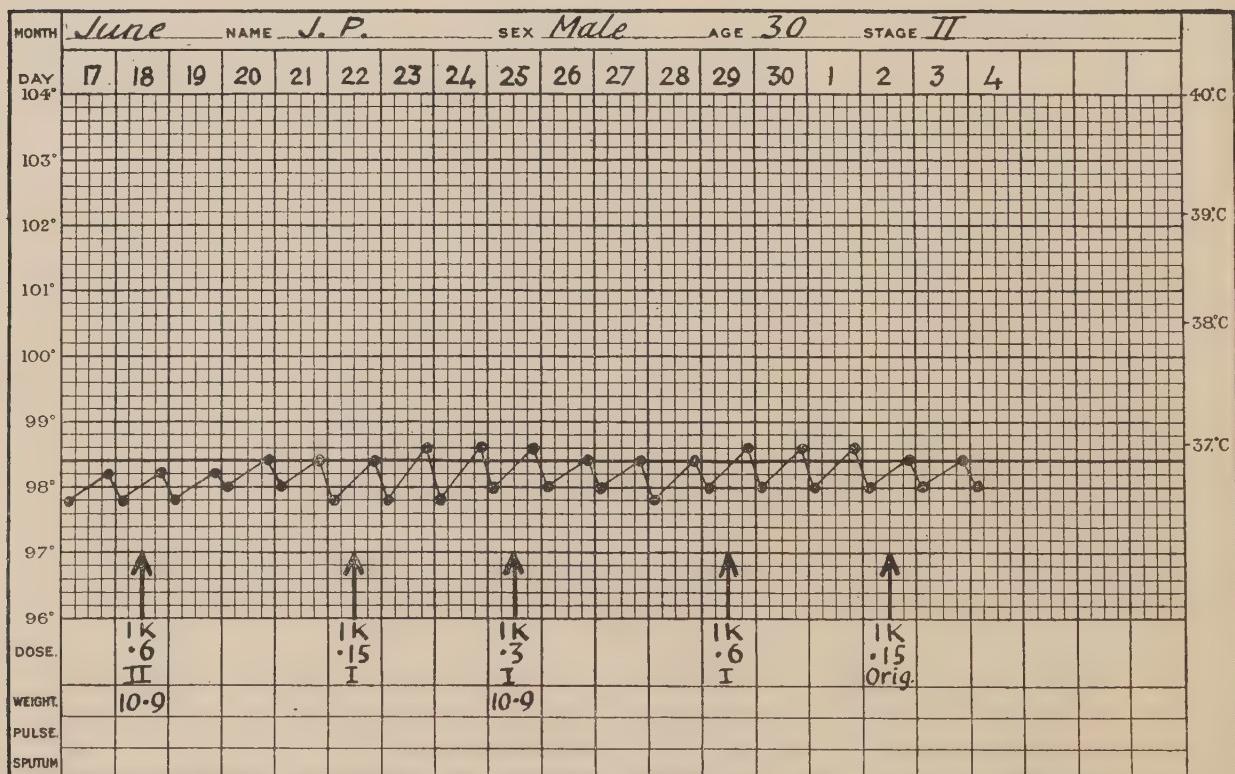


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